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Variety of Methods for Treating Water

WE would call attention to an article in another column by Mr. George C. Whipple, one of the foremost experts on water purification in this country, in which he refers, more or less incidentally, to the increasing number of methods for treating water which are now recognized as being of great value or which will probably be quickly developed to the point where they will become so. Only a few years ago water purification meant, to most persons at least, sand filtration and nothing else, and the details of this were copied from one plant to another. Now the decision to purify water is merely the starting point of a design and there remain to be studied a multitude of conditions and the applicability to each of these of the various processes and details from which the expert can make a choice. It follows from this that the services of an engineer qualified to make intelligent choice between these is more necessary than ever; and also that if such a choice is made the desired results can be obtained more surely and completely, and also more economically, than ever before. This differentiation of methods is undoubtedly largely due to the appreciation of the desirability of removing from potable water other matter than mere suspended mineral substances or even bacteria, since processes are now used for removing hardness, color and other dissolved matters objectionable from a sanitary point of view or from natural prejudice. Seven or eight different methods of treating water are named in this article, each being most useful under certain conditions; one, however, which appears to be making a successful claim for recognition is not mentioned, namely, completely sterilizing water. The effecting of this by chemicals has not been very generally advocated, except the use of copper sulphate which, however successful it may be in removing algæ, is not yet generally recognized as being a reliable germicide. Ozone, however, when used experimentally, has appeared to give nearly perfect results by the destruction of a very high percentage of all bacteria and, containing no chemicals, it does not substitute for the bacteria a possible element of danger in the form of chemical pollution. The chief objection to it at the present time, assuming that perfect sterilization is desired, is the expense. There is now being conducted at Jerome reservoir, of the New York Water Supply, a series of experiments on the new method of sterilizing by ozone, which is considered favorably not only by its promoters, but by some of the city officials who are keeping in touch with the experiments, which method is said to be much less expensive than any other heretofore developed. The results of this test will not be available before the end of this year, but will be awaited with much interest.

Water Works Records

IN the columns of this issue appear several tables and articles which illustrate both how little in the way of accurate information concerning the operation of municipal utilities is available, and, on the other hand, how completely and carefully such matters are being analyzed and studied by some officials. That it is not merely a case of not publishing these data is shown by the experiences of the National Board of Fire Underwriters, whose engineers have visited a considerable number of cities and

used all ordinary means for obtaining full information concerning the waterworks plants which furnish them with fire protection. In a number of cases they found no records of the number of valves or hydrants or of the miles of pipe; and in very few indeed were there any records of the condition of valves, the frequency and nature of the repairs made on these and on the hydrants. Recording pressure gauges were by no means in general use. In several cities neither the mean nor maximum daily consumption was known.

As to the information given in annual reports, it is possible that the purposes which superintendents have in view in issuing them do not call for the publication of certain details, such, for instance, as the number of meters repaired and the cost of such repairing, total cost of a meter during a certain number of years of service, etc. But it does appear to us that these are of fully as great value and interest as many other matters published, such as lists of locations of fire-hydrants, inventories of picks and shovels, and the like. The desire for such information is not one of curiosity only. Such data are useful for assisting in determining the net saving to a water department of adopting meters, the most durable and economical make of meter, valve, etc. In connection with road maintenance the aims are well stated by Frank J. Eppele, as quoted in the columns of Review of the Periodicals; while the keeping of construction accounts is illustrated and the advantages therein referred to in the article entitled Record-Keeping on Street Paving. Cities whose water departments keep such excellent records as do those of Reading, Pa., Rochester, N. Y., and others encourage universal imitation.

MODERN TENDENCIES IN FILTRATION

Latest Theories Concerning Purification of Water—Sand Filters—Mechanical Filters—Preliminary Treatment—Cleaning Filter Sand—Patents

By GEORGE C. WHIPPLE, Consulting Engineer.

No startling developments in the art of water filtration have taken place during the past few years, but there has been a gradual evolution which has resulted in material improvements in several directions. Such changes as have occurred have related especially to details.

The general principles of the art which were established by the experimental work of the previous decade have gradually become crystallized. One phase of the theory of sand filtration is perhaps deserving of notice. In the early days sand filtration was regarded as a mere straining out of the particles of suspended matter. The work of the German investigators brought to the front the theory of the schmutzdecke, which, for a time, was regarded as all important. Later investigations have served to re-emphasize the importance of physical action. The sand filters at Washington, Philadelphia and elsewhere have shown that purification can take place without the formation of a definite schmutzdecke, and that where waters heavily charged with sediment and comparatively lacking in organic matter are filtered sedimentation in the pores of the filter controls the result more than any other one factor.

The relative applicability of sand and mechanical filtration seems to have become rather definitely settled. Most engineers agree that for clear, colorless, but polluted waters sand filtration is preferable, while for high-colored and turbid waters mechanical filtration is necessary. Local conditions, however, must always be an important element in deciding upon the relative merits of the two systems for any particular case, and frequently cost is the controlling factor. In some cities disputes in regard to the relative merits of the two systems still persist, but for the most part they have been disputes between laymen and not between engineers.

Sand Filters

Looking first at sand filtration, the details which have been most subject to modification during the past few years have been those which relate to sand washing, and to the use of preliminary treatments for the purpose of enabling higher rates of filtration to be used.

Since the construction of the Albany filter the methods used for washing sand have undergone somewhat radical changes. The old method of hand washing first used abroad was followed by the use of the ejector as adopted at Albany. Somewhat later the use of the "sand-box" method was introduced at Yonkers and Poughkeepsie, the sand being washed by a process somewhat similar to that which takes place in the bed of a mechanical filter. This method has proved more efficient than the ejector, but as the washed sand comes out in a comparatively dry state it is not as advantageous as the ejector method when the sand has afterwards to be transported by water. The ejector method of washing has been elaborated and vastly improved at the Washington filter and at some of the other large plants. By the use of these improved sand washers it has been found possible to reduce to a very considerable extent the first cost of sand needed for a sand filter, as well as the cost of washing the dirty sand removed from the beds.

Changes have also taken place in the method of scraping and removing sand from the filters and in the manner of handling it after it has been removed and washed. The old method of scraping with shovels and barrows has been replaced in such large filters as those at Albany, Washington and Philadelphia, by the use of shovels and movable ejectors. In Washington the sand is stored in bins after washing, and later distributed in carts to the various filters as needed. In New Haven, the sand bins have been done away with, and in place of them a larger filter area has been provided so that the sand can be put back into an empty bed as soon as it has been washed. A number of mechanical sand scrapers have been introduced, and while they are still in an experimental stage it is possible that they may play an important part in future developments of sand filtration. In the filter at Bethlehem, Pa., the sand is removed by shovels

to a movable ejector running on a track over the bed; in Pittsburg it is proposed to use a combined mechanical scraper and ejector; at Yuma a still more elaborate device is in use, and experiments as to its efficiency are about to be made at the experiment station at Jerome Park, New York City. The latter is practically a device for washing the sand in place. At one of the filters at the Brooklyn waterworks on Long Island the sand is cleaned simply and cheaply by a method of flooding and raking.

It seems likely that in the filter plants of the future these methods of removing dirty sand from the filters will become differentiated according to the nature of the water which is being filtered. If the suspended matter removed from the water is of such a character that it remains on or very near the surface of the sand, a different method of sand scraping can be used than in those cases where the suspended matter is so fine that it penetrates the sand layers to a considerable depth.

Preliminary Treatment

The relative merits of sedimentation, coagulation and the use of preliminary filters, commonly known as scrubbers, is now being considered in many places, but thus far no definite conclusions have been reached. It seems likely that in this matter also the practice in the future will vary according to the character of the water. In cases where the suspended matter is comparatively coarse, sedimentation or the use of scrubbers may be found advisable, but in the case of waters bearing large amounts of very fine clay, or in case of colored waters, it is probable that scrubbers will not give as satisfactory or as economical results as the use of coagulation and sedimentation.

Another form of preliminary treatment also deserves mention—namely, aeration. This is especially important where waters are to be filtered which contain large amounts of microscopic organisms. Here the need of thorough oxidation and aeration are of the utmost importance. Perhaps the most interesting filter which has been constructed for the purpose of removing algæ from water is that built at Springfield last year to purify the anabæna-laden water of the Ludlow reservoir. The method is that of intermittent filtration through a sand layer so arranged as to provide a very thorough aeration of the entire bed, as well as aeration of the effluent after it leaves the filter. The filter has been in use one season, but the results obtained thus far have been so satisfactory as to indicate that this method, or a modification of it, may be much used in the future—especially as recent studies made for the New York Water Board have indicated that the troubles from algæ may be overcome more cheaply by filtration than by the stripping of soil from reservoir sites.

Mechanical Filters

In the case of mechanical filtration, which is much more complicated in its mechanism than sand filtration, the changes during recent years have been considerable. Perhaps the most noticeable have been an increase in the size of the filter units, the omission of mechanical devices for stirring the sand at the time of washing, and even the omission of the use of compressed air for the same purpose. At the filter which is being built for Cincinnati the sand is to be washed without the use of air or mechanical agitators, but the wash water is to be applied at a rate approximately twice as great as when compressed air is used. This increased rate of applying the wash water has necessitated the use of a screen between the sand and gravel layers to prevent the materials from becoming mixed, and the use of this screen is said to be covered by a patent.

Many different styles of controllers have been put in use, but some of them have not given entire satisfaction. These controllers are so numerous, and many of them so complicated, that no adequate description can here be given. One of the most interesting types, however, is that involving the use of balanced cylinders, which has been adopted for the filter plant now under construction in New Orleans.

An important development of the future is likely to be in the form of mechanical filters which not only purify the water, but also soften it. A plant which will do this is under construction at Columbus, O., and this is destined to be followed by many others. This subject has brought up many new problems of chemical treatment.

In some of the recent filters which have been constructed largely for the purpose of decolorizing water interesting facts have been learned in regard to the reactions between the alum and organic matter. It has been found that in very soft waters there is a decided advantage in applying the alum before it enters the coagulation basin, and the soda after it leaves it. This results in a saving of alum, and, if the coagulation basin is open, it prevents the growth of algæ in it.

Some interesting developments have also taken place in filters devoted to the removal of iron from water. Perhaps the most unique case is that of Reading, Mass., where clay is applied to the water before filtration for the purpose of facilitating the precipitation of the iron.

One topic in connection with mechanical filters deserves special mention—namely, that of patents. During the last few years suits have been brought, or threatened, against parties using certain devices covered by patents, such for instance as the use of the so-called "draft-tube," which produces a "negative head" on mechanical filters; the use of a screen between the gravel and the sand layers mentioned above; the use of a ridged bottom in filter beds; the use of compressed air in washing, etc. The validity of these patents has not been fully established and it seems likely that in the near future interesting suits may occur.

In conclusion it may be said that perhaps the most important fact of all in connection with water filtration is the rapidity with which the idea of purification is being adopted throughout the country. The movement in favor of improved water supply has greatly extended during the past few years, and the standard demanded by the public has correspondingly increased. Waters which a few years ago were accepted without question are now being condemned as unfit for use without purification, and there seems reason to believe that during the next decade there will be even a greater trend in this direction.

STERILIZING WATER BY OZONE

Nature of Ozone—Its Production—Use in Water Purification —Various Plans of Operation—Cost of Sterilizing Water—Other Data

The use of the best sand filters in the purification of water results, under careful management, in a reduction of the bacterial content by 95 to 98 per cent. under working conditions; and it is claimed by some that the percentage of pathogenic germs destroyed is even greater than this, although others claim that it is less. However this may be, there can be no certainty that the effluent does not contain a few such germs; and since, as long as these are present, perfection has not been attained, efforts are still being made toward absolute destruction of all bacteria by the use of some germicide. That which has received most favorable consideration in water purification is the use of ozone. This agent would probably have come into practical use before now were it not for the expense involved. In fact, several German plants and at least one French have already been installed for this purpose. The plant recently installed at Saint Maur near Paris, France, in which the de Fries system is used, is said to have demonstrated that the cost of sterilizing water by this method need not exceed 12.39 francs per thousand cubic meters, or say 0.9 cent per thousand gallons; this cost being based upon the following: Power required, for electric energy, 47.76 horsepower per thousand cubic meters per hour; to raise this amount five meters to the top of the sterilizer, 18.90 horsepower; drying the necessary air by refrigeration and injecting it into the water, 32.64 horsepower, a total of 99.30 horsepower per thousand cubic meters per hour; say 15.66 horsepower per million gallons per day. The cost of this 99.3 horsepower is assumed to be $1.07 per hour; oil, etc., 12 cents; labor, four men at 14 cents, 56 cents per hour; interest and depreciation (at 6 per cent. on $100,000), 68.6 cents per hour; insurance, 4 cents per hour, or a total of $2.48 per thousand cubic meters, or about $9.37 per million gallons. From an article read before the Franklin Institute by James Howard Bridge, entitled "Ozone: Its Nature, Production and Uses," the following extracts are taken:

"There is no discovery in modern chemistry that is more important than that of ozone," wrote Frémy, the French scientist, a generation ago; and to this the illustrious Bunsen joined the prediction: "When we shall be able to produce it industrially, hundreds of new applications will arise."

Recent developments in electrical science have been so sensational that the quiet emergence from the laboratory into commercial use of this new agent in industry, sanitation and therapeutics has been unmarked by any save the few experts who have wrought the change. Our admiration has been challenged by spectacular feats in wireless telegraphy and the like; and the evolution of new manufacturers, the application of perfected sanitary processes, the establishment of new therapeutic principles, made possible by the fulfillment of Bunsen's prophecy, have received a few casual notices in technical publications, which have promptly dropped into the oblivion of the files of public libraries.

The Nature and Properties of Ozone.—Ozone is a form of oxygen, which, by readjustment of its molecular structure, has acquired new physical and chemical properties while preserving its original elemental character. A molecule of oxygen consists of two atoms, and in physics the element is written O_2. Ozone has three atoms to the molecule and is written O_3. This extra atom endows ozone with special powers which differentiate it from ordinary oxygen. The differences have been tabulated by the French chemist, Houzeau, as follows:

Properties of Ozone + 15°.	*Properties of Oxygen + 15°.*
A gas with strong odor, and a flavor of lobster.	A gas colorless, inodorous, tasteless.
Commences to decompose at about 100° C.	Very stable at all temperatures.
Strong oxidizing agent.	Feeble oxidizing agent.
Decolorizes blue litmus.	Without action on blue litmus.
Rapidly decomposes potassium iodide, liberating the iodine.	Does not decompose potassium iodide.
Rapidly oxidizes ammonia, and transforms it into nitric acid.	Without action on ammonia.
Decomposes hydrochloric acid, liberating chlorine.	Does not react on hydrochloric acid.
Combines with phosphoreted hydrogen with emission of light.	Without action on phosphoreted hydrogen.
Oxidizes silver.	Does not oxidize silver.
Corrodes India rubber and cork.	Does not corrode India rubber nor cork.

The Production of Ozone.—The ozone made by early investigators was generally obtained by chemical means. . . . Later it has been obtained by heating air over a Bunsen burner. . . . If radium is enclosed in a tube filled with oxygen, ozone is formed inside the tube. . . Ozone is also produced by the decomposition of water by the electric current. . . . It is also produced by an electric discharge taking place through a separating body of oxygen or atmospheric air. . . . In its simplest form an ozonizer consists of two metallic bodies separated from each other by a short gap, across which a current of electricity may be passed, in the form of a blue-flaming discharge, from one metallic body or electrode to the other. The electrification of the air in the path of the discharge produces the molecular changes involved in the conversion of O_2 into O_3. This so-called silent or ozone-making discharge may be produced in several different ways. The earliest mechanism employed for this purpose was a static machine. . . . A current from a battery of cells may be passed through an induction coil furnished with an interrupter; and this will give a small but steady and efficient ozone-making discharge. The direct current from a dynamo may also be used if passed through a similar coil. It is, however, the alternating current from a dynamo of high periodicity, steeped up to several thousand volts, which offers the best means of obtaining the silent discharge; and this is the means in general commercial use to-day.

Ozone in Water Purification.—Considerable difference of opinion exists among experimenters concerning the minimum concentration of ozone requisite for the effective sterilization of water. Tests have been made in Europe with concentration as low as 0.5 gram per cubic meter of air and as high as 15 grams. In each case satisfactory results have been achieved, as shown by bacterio-

logical tests. Indeed, as low as 0.3 was found effective by Professor Van Ermengem in tests made at Brussels. At Gennekin, Schneller has successfully used concentrations as low as .537. At Rotterdam, Van Delder, using the Vosmaer system, obtained satisfactory results with an average concentration of .8; and Professor Proskauer, at Berlin, found .9 to 1.8 efficient. The following is an extract from the report of tests of the de Fries plant near Paris made by the official authorities of that city:

Concentration	Air per M. of Water in Cubic Meters	Total Ozone Per Cubic Meter of Water	Bacteria Before Ozonization	Bacteria After Ozonization	In the Collecting Tank
1.6	1.383	2.216	800	2	4
1.04	.....	2.035	850	3–4	..
.98	2.077	1.352	2682	3	..
.88	1.537	2.04	3732	7	..
1.	1.003	1.	2886	9	..
.835	1.003	0.693	2886	45	..
1.12	1.037	1.61	4445	14	9
1.43	0.831	1.188	145	2	1

At Weisbaden and Paderborn, Germany, the Siemens & Halske apparatus in use there show the following results:

Concentration in Grams of Ozone per Cubic Meter of Air	Number of Germs per c.c. Raw Water	Number of Germs per c.c. Ozonized Water
1.4	39,000	8
1.7	26,000	12
1.6	55,000	5

At Philadelphia, during a protracted series of tests during the year 1905, the following results were achieved with low concentrations:

Concentration	Oxygen Consumed Before	Oxygen Consumed After	Air in Cubic Feet	Water Treated, Gallons	Bacteria Before Ozonization	Bacteria After Ozonization
.7	1.34	.37	4950	12800	12500	19
.64	.74	.57	5020	37500	4600	200
.68	1.01	.97	4800	37000	600	60
.35	1.06	.83	4840	35400	160	11
.49	1.77	1.03	5010	20200	75	10
.6	....	....	4930	20000	5400	15
.78	....	....	3045	29700	170000	42
.83	....	....	3080	30500	130000	70
.87	....	....	4196	28200	80000	34
.47	....	....	4196	31800	1200	20
.62	....	....	3113	30650	73000	250
.91	....	....	2775	29100	1800	9

The quantity of ozone absorbed varies with the amount of organic matter contained in the water. In distilled water ozone is but slightly soluble. Nor does the number of bacilli present in water make any preceptible difference in the amount of ozone absorbed; for, however great their number may be, they represent an infinitesimal weight of organized matter to be consumed. Otto finds the ozone absorption of waters treated by him to vary between 0.5 gram and 0.8 per cubic meter of water treated, and asserts that these figures are corroborated by tests made by Dr. Erlwein at Weisbaden. Similarly, at St. Maur, Mr. Van der Made, engineer to the Sanudor Co., told the writer he had found that about half a gram of ozone is absorbed in the sterilization of a cubic meter of river Marne water after rough filtration.

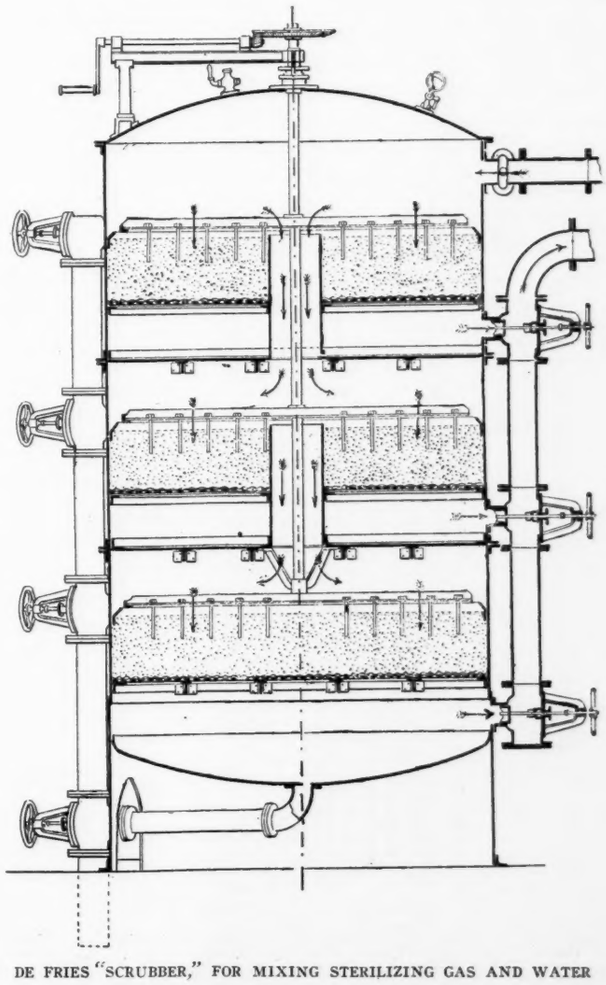
The unutilized ozone is withdrawn from the surface of the sterilized water by Otto, de Fries and Siemens & Halske, and passed in continuous, successive cycles through the ozonizer and sterilizer. In this way they claim to save about two-thirds of the ozone produced. In the Howard-Bridge method the unabsorbed ozone is drawn from the treated water by the suction action of another current of water running rapidly down a U-shaped tube, sunk deeply into the ground. Here it is all used up in the preliminary oxidation of organic matter, so that when fresh ozone is added to this water the ozone is free to act with its primal strength upon the bacteria. In the Vosmaer system the excess of ozone is allowed to escape into the air.

A number of mechanical means have been devised for mixing the sterilizing gas with the water under treatment. The one most generally used consists of a tower, sometimes filled with stones or other inert matters over which the water trickles and meets the ozonizing gas forced into the tower at the bottom. This is the column invented by Gay-Lussac and called by his name. It was used by de Meritens, the pioneer in ozone sterilization, and adopted by Siemens & Halske in their installations at Weisbaden and Martinikenfelde near Berlin. It is a simple and efficient means of mixing the sterilizing gas and water. Analyses by Dr. Erlwein of the water before and after purification, covering a period of several days, yield the following reports:

Bacteria per c.c. Before Purification			Bacteria per c.c. After Purification		
Maximum	Minimum	Average	Maximum	Minimum	Average
200,000	2,300	80,000	34	0	8

All pathogenic germs were destroyed. The amount of ozone used per cubic meter of water was 1.3 grams.

According to Dr. Erlwein, the cost of this process per cubic meter of water (264.17 American gallons) for a



DE FRIES "SCRUBBER," FOR MIXING STERILIZING GAS AND WATER

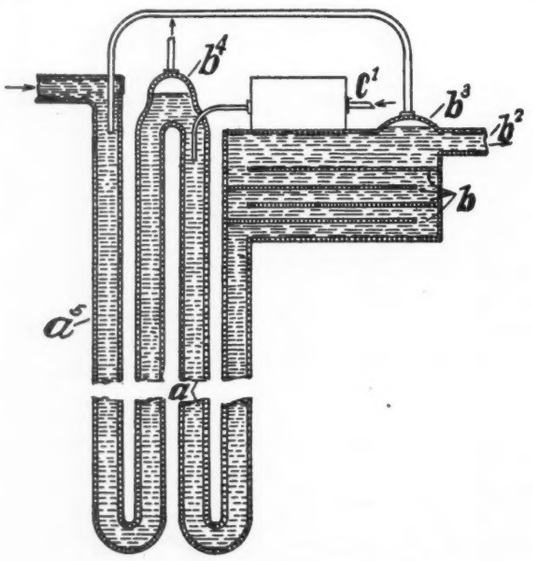
plant treating about 250 cubic meters per hour is 2 pfennigs or half a cent.

In American equivalents this is at the rate of $18.92 per million gallons in a plant capable of treating about 60,000 gallons of water an hour. Dr. Erlwein estimates that for a similar plant of 10,000,000 gallons a day capacity, the cost of operation would be about $7.00 per million gallons.

In the de Fries system the water and ozonized air are mixed in vertical cast iron cylinders enameled inside. The water and air are introduced at the bottom and leave the apparatus at the top. The cylinders are divided into compartments by horizontal celluloid trays perforated with numerous small holes. On passing through these perforations the water and air are brought into close contact.

The operation of these and other systems involves the use of an air compressor for forcing the ozonized air into the column of water. As seen in Dr. Jackson's report on the Vosmaer tests, this required 4.4 horsepower hours for the treatment of 25,650 gallons. This is at the rate of about 160 horsepower hours or 110 kilowatt hours per million gallons treated. In addition to this expenditure of energy, there are other disadvantages inseparable from this method of mixing the air and water. Ozone has such active oxidizing properties that ordinary lubricants cannot be used in the cylinder of an air compressor. The rings of the piston must, therefore, fit so tightly that if air is passed through the cylinder containing the least moisture, the machine either works with great difficulty and loss of power, owing to the swelling of the piston rings, or else stops entirely.

This difficulty is overcome, and a large part of the cost of operating an air compressor is saved by the Howard-Bridge process of causing the suction action of the water under treatment to draw into itself the ozonized air required for its purification. This principle is roughly shown in the accompanying drawing, which also illustrates the further advantage already mentioned, in that the excess of ozone which remains unabsorbed, and which in some system is run to waste, is here utilized in the preliminary treatment of the water. By this system municipal water supplies can be sterilized at one-half the cost of slow sand-filtration, which never wholly removes bacteria.



HOWARD-BRIDGE—METHOD OF MIXING

Raw water enters the pipe a^5 drawing, by suction unabsorbed ozone from b^3. The wastegases escape at b^4. The current of water in a sucks fresh ozone into itself from the ozonizer c; and after passing around the baffle plates in b, the purified water escapes at b^2.

Suggestions for High Pressure Fire System

FOR increasing the fire protection of Baltimore, Md., by use of the million dollars, the appropriation of which was recently made, Fire Chief G. W. Horton stated recently that he would recommend, among other things, the construction of a high pressure pipe line, which should ordinarily carry the normal city pressure, but would also be connected with the pumping station at the water front, by means of which a much higher pressure could be obtained. "I would," said he, "do away with post hydrants entirely in the business section and, instead, would have surface connection with the mains in the middle of the street by means of openings, covered over with metal plates, like manholes. They would be, according to the plan, close together, say, only 30 feet apart. At each I would have one 4½-inch connection, which would fit the fire engines, and two 2½-inch connections, which would fit the regulation hose of the department. They could be used in case of a fire of not unusual size just as at present, with engines and hose. But in the event of a big fire, a conflagration that threatens whole city blocks, the plan offers opportunity for a device that is altogether new and, to my mind, thoroughly practical. It is an idea of my own and has never been put into operation. To the 4½-inch connections could be screwed what are known as monitor nozzles. They are nozzles that would stand up from the ground for two or three feet, and, as they are operated by levers, can be made to direct their stream in any direction. Once set in place, they will operate in a given direction until some one changes it by means of the lever. With a high pressure pipe line the stream could reach to a six-story window, and the danger to men of being knocked over and perhaps having their legs or ankles broken in trying to handle a hose under high pressure would be entirely obviated. With a flat-nozzle attachment, big, spereading fires can be fought. One of the nozzles will throw the stream in a perfect curtain more than 30 feet wide. From the hydrants situated only 30 feet apart could come just as many of these streams as would be needed, making a perfect curtain a block or more in length. The curtain could be directed by use of the levers to any reasonable altitude, and the men could then step back out of the danger line, the automatic nozzles taking care of the fire. Danger to life and limb through falling cornices, breaking glass and similar occurrences would be avoided completely, and that, too, with a far more adequate protection against the progress of the fire than could be obtained by the use of hose. It would be the first time that such a fire-fighting device has ever been employed."

WATER WORKS STATISTICS

Consumption, Metering, Pressure, Sizes of Mains and Depth of Same, Details of Fire Hydrants and Valves, of a Number of Cities—Recommendations of National Board of Fire Underwriters

THE National Board of Fire Underwriters has, for about two years past, been investigating, through its own agents, the fire-fighting facilities and fire hazards in various cities in the eastern part of the United States, and publishing the results of these, the total number of reports of such investigations published to date being 41. The data concerning waterworks thus collected are probably more valuable than any similar information heretofore obtained by other methods, since previous reports have been undoubtedly more or less colored by local prejudice, ignorance of standard conditions elsewhere or a desire to make a good showing for the various plants; whereas these investigations, since they are to form the basis of commercial transactions in the form of fire insurance, are probably as reliable as could be obtained. In the accompanying tables we have endeavored to present in tabulated form the more important items of information contained in these reports concerning features common to all plants. The reports contain very much additional, interesting and valuable information concerning the operation of pumping plants and tests made to determine the amounts of water which could be delivered simultaneously by a number of fire hydrants, which are too voluminous for presentation in these columns.

	City	Population	Ownership	Organization		Source of Supply	Records
				Control	Maintenance Force		
1	Everett, Mass.	29,108 in 1905	Municipal	B'd Pub. W'ks; 4 members appointed by Mayor for 5 years.	Regular force, 8; extra special civil service requirements.	Metropolitan system from Nashua river.	Location of mains, valves and hydrants on atlas sheets.
2	Malden, Mass.	39,693 in 1905	Municipal	B'd Pub. W'ks; 3 members appointed by mayor, confirmed by council.	About 6.	Metropolitan system, from Nashua river.	Generally complete and up to date. Hydrants not all shown.
3	Quincy, Mass.	28,800 in 1905	Municipal	Commissioner of Public Works, appointed an'lly by Mayor, confirmed by council.	Regular force, 10; appointed by Commissioner	Metropolitan system, from from Nashua river.	Generally complete and up to date.
4	Taunton, Mass.	34,000 in 1905	Municipal	Board of 3 Commissioners, one elected each year by aldermen.	Regular force, 22, including 9 at pumping station; appointed by Commissioners under civil service.	Two ponds, 10 miles from centre of city, pumped from lower to higher; gravity from latter.	Records not convenient. No map of distribution system. Records of valves and hydrants not complete. Card index system being installed.
5	Derby, Conn.	7,930 in 1900	Private	Birmingham Water Co.		Gravity from reservoirs 1 mile east of business centre.	
6	Trenton, N. J.	84,180 in 1905	Municipal	Board of 6 Commissioners; 2 appointed each year by city council.	Regular force about 40; political appointments.	Pumped from Delaware river to reservoir 1¼ miles from city hall.	Records incomplete, detail plans lacking. Plan of distribution system not up to date.
7	Wilmington, Del.	85,496 in 1906	Municipal	Board of 3 Commissioners, 1 appointed every two years by mayor.	Regular force, 75; 130 additional now on construction work.	Pumped from creek to reservoir; repumped to higher reservoir, and still higher standpipes.	Records complete. Large plan of distribution system shows essential features, plans on large scale show details.
8	Charlotte, N. C.	26,000 in 1907	Municipal	Board of 4 Commissioners, 2 elected each year by aldermen and Mayor, ex-officio.	Regular force, 11, including 3 foremen, appointed by Superintendent and approved by Board.	Impounded creeks, filtered and pumped.	Records of old works lacking; of new works fairly complete. No annual report.
9	Wilmington, N. C.	32,000 in 1907	Private	Clarendon Water Co.	About 10 men.	Direct pumping from North East Cape Fear river; filtered.	Access to maps and plans refused by the company.
10	Columbia, S. C.	28,000 in 1907	Municipal	Water Works Committee, consisting of Mayor and 3 aldermen, appointed by him for two years.	About 15 men.	Direct pumping from Saluda river; filtered.	Destroyed by fire. Map being prepared showing all details. No annual report.
11	Brunswick, Ga.	12,000 in 1907	Private	Mutual Light and Water Co.	Eleven men.	Air lift from Artesian wells to reservoirs; thence by direct pumping. Five 6" and 8" wells, 480' deep.	No plan of distribution system; records of valves, hydrants and consumption incomplete.
12	Columbus, Ga.	25,000 in 1907	Private	Columbus Water Works Co.	About 10 men.	Direct pumping from creek; river supplementary; filtered.	Plan showing essential features of distribution system. Records not complete.
13	Macon, Ga.	38,000 in 1907	Private	Macon Gas, Light and Water Co.	Fifteen regular employees.	Direct pumping from river; filtered.	Fairly complete. Lengths of mains and details of valves and hydrants not known.
14	Rome, Ga.	12,000 in 1907	Municipal	Board of 3 Water Commissioners, elected by council, one each year.	Regular force, 9 men.	Pumped from river to filters, thence by gravity to mains.	Not complete. No detail plans of distribution system. No reports printed.
15	Jacksonville, Fla.	42,000 in 1907	Municipal	Board of 9 Trustees, elected by council, one each year.	Regular force, 35, appointed by Board.	Direct pumping, from 8 artesian wells.	Destroyed by fire. Fairly complete data on hand. General plan being prepared.
16	Pensacola, Fla.	28,000 in 1907	Private	Pensacola Water Co.	Regular force, 7.	Direct pumping, from 12 6" wells, 112' to 160' deep.	Locations of mains and appurtenances shown on plan. No data of lengths of mains or consumption.
17	St. Augustine, Fla.	5,250 in 1907	Municipal	Board of 5 Trustees, elected by people, one each year.	Regular force, 5.	Direct pumping, from two 10" and 12" wells, 520' deep.	Location of mains and appurtenances shown on map. Other records incomplete. No reports.
18	Tampa, Fla.	37,000 in 1907	Private	Tampa Water Works Co.	Regular force, 15.	Direct pumping, from 13 10" wells and a spring.	Fairly complete and up to date.
19	Montgomery, Ala.	55,000 in 1907	Municipal	Mayor and Water Committee of five councilmen	Regular force, 21; reported inadequate.	Direct pumping, from 17 artesian wells, 6" to 10" diameter, 256' to 710' deep.	Fairly complete; but no plan of distribution system to suitable scale.
20	Nashville, Tenn.	120,000 in 1906	Municipal	Board of Public Works, 3 members, one elected by people every two years.	Regular force, 50.	Pumped from river, through infiltration galleries, to reservoir, thence by gravity.	No satisfactory general plan of distribution system. Detail plans not up to date.

In the tables data are given concerning the twenty cities last investigated, the population of which varies from 5,250 to 120,000. Thirteen of the plants are municipal and seven are private. Briefly summarized, the data given show that the control of the plants in six cities is in the hands of a commission of one, three, four or six members; these being appointed by the mayor in two cities; by the council in three, and by both in one. In three cities control is in a Board of Public Works of three or four members. In two cities a waterworks committee, composed of the Mayor and three or five Councilmen, have charge of waterworks affairs; and in two cities these are in the hands of trustees. The maintenance forces average about one for each 2,000 population, varying from one in 1,050 to one in 6.600. Only five of the twenty cities have kept really satisfactory records and several have no records at all worthy of the name.

Four have no records of consumption and several of the others estimate this from insufficient data; but using such rates as seemed the most probable, the mean consumption is found to be about 76 gallons per capita. The maximum consumption is oftenest in the summer in the north and in the winter in each of the southern cities, a condition which would hardly have been anticipated, by the writer at least, but which was due in many of the southern cities to winter tourists. The percentage of services metered varied from none to all, the mean of all of the cities being about 42 per cent. metered, a better showing than would be generally anticipated or than would have been found a few years ago. Four cities report a regular house to house inspection for suppressing leaks. The pressure in the various cities is from 8 to 110 pounds, the maximum range in any one city being from 6 to 70 pounds, with an average of 39 pounds.

City No.	Consumption, Gallons Per Capita			Method of Preventing Waste	Services	Pressure		
	Average	Maximum	Season			Pounds	Location	Gauges
1	90	120	Cold weather.	2% of services metered. Continuous house-to-house inspection by 3 inspectors.	Low service for ¾ of town; high service for several detached areas.	54–88 35–65	At 51 hydrants.	Permanent, non-recording at city hall and central fire house.
2	50	54	.....	All services metered.....	Low service for ¾ of town; high service for several detached areas.	43–107 40–64	At 88 hydrants.	Recording gauges, one on each service.
3	111	120	Summer.....	10% of services metered.....	One service, direct pressure.	23–93	At 136 hydrants.	Pressure gauge at central fire station. Recording gauge at pipe yard.
4	69	77	Summer.....	46% of services metered.....	One service, direct pressure.	22–61 100–110	103 hyd'ts. Fire pres're	Recording gauge at city hall; 6 non-recording.
5	.....	.....	.....	.....	One service.....	43–110	15 dydrants..	
6	139	196	Winter.....	No inspections. 1½% of services metered.	One service.....	8–45	30 hydrants..	Non-recording gauge at water dept. office.
7	116 67 41	130	Summer.....	21% of services metered.....	Low service..... High service..... Extreme high.....	11–52 12–66 23–75	255 hyd'ts.	No recording gauges.
8	102	135	Summer.....	All services metered. No inspection.	One service.....	45–80 75–100	52 hyd'ts. Fire pres're	Recording gauge at pumping station. Three non-recording gauges.
9	Information refused.			Most of the services metered.....	One service.....	Information refused.		Recording gauge at company's office; non-recording at engine h'se.
10	No records		August.....	95.0% of services metered.....	One service.....	No records.		No gauges in use.
11	No records.		Spring.....	No meters.....	One service.....	About 22	.....	At fire and pumping station.
12	No records.		Winter.....	About ¾ of services metered.....	One service.....	40–90	34 hydrants.	Recording gauges at Co.'s office and fire department.
13	89	97	Winter.....	All large consumers metered...	High service..... Low service.....	36–80 40–64	44 hydr'nts	Recording gauge at pumping station. Two non-recording.
14	108	120	Winter.....	20% of all services metered. No inspections.	One service.....	35–76	30 hydrants..	No gauges in use.
15	70	115	December....	71% of services metered.....	One service.....	52–63	2 hydrants...	Recording gauge at pumping sta'n
16	No records.			40% of services metered. House-to-house inspections twice a year.	One service.....	44–78	51 hydrants..	Non-recording gauges at Co.'s office and two others.
17	97	168	Winter.....	10.8% of services metered.....	One service.....	41–47	32 hydrants..	Recording gauge at water office.
18	60	96	Winter–Sp'ng	Some meters.....	One service.....	44–65	34 hydrants..	Recording gauge at Co.'s office.
19	51	65	Winter.....	About 50% of services metered; inspections.	One service.....	36–100	95 hydrants..	Recording gauge at pump'g stat'n
20	158	.....	.....	52% of services metered. House inspection and waterphone.....	Main service..... High service.....	19–88 38–68	162 hydrants.	Recording gauge at water office.

WATER MAINS

City No.	Total Length, Miles	Percentage of Total Having Diameter of									Material	Depth, Below Surface	Specifications Used
		Less than 4"	4"	6"	8"	10"	12"	14"	16"	18"	More Than 18"			
1	43.51	.....	13.7	56.0	8.1	16.4	2.4	0.1	0.9	.....	2.4	Cast iron; 3,394 of 4" and 6" cement lined.	5 ft. cover.....	N. E. W. W.
2	21.12	.....	10.6	9.4	2.8	.....	3.0	.....	.....	.....	.....	Cement lined.....	4½ to 5 ft. cover.....	Usual requirements.
	61.54	.....	4.0	36.6	13.6	5.8	12.1	2.1	.....	.....	.....	Cast iron.....		
	82.66	.....	14.6	46.0	16.4	5.8	15.1	2.1	.....	.....	.....	Total.....		
3	92.419	.....	19.93	45.03	18.30	6.60	4.83	.....	4.76	.....	0.55	Cast iron.....	5 ft. cover.....	N. E. W. W.
4	58.4	.....	13.6	53.3	15.7	0.1	8.4	.....	7.5	.....	1.4	Cast iron.....	5½ ft. to center of pipe.	
5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
6	108.0	0.9	24.7	45.0	8.1	4.6	4.5	.....	7.3	.....	4.9	Cast iron.....	4½ to 5 ft. cover.....	300-lb. guarantee.
7	117.00	2.2	20.6	19.4	31.1	1.0	8.1	.....	4.0	.....	4.6	Cast iron.....	4½ ft. cover.....	Approx. N. E. W. W.
8	19.27	.....	27.3	55.5	2.6	1.2	5.6	.....	2.9	.....	4.9	Cast iron.....	3 ft. cover, 18 in. minimum.	300-lb. guarantee.
9	10.	.....	5.7	50.9	16.3	3.3	23.8	.....	.....	.....	.....	Approximate.....	3 to 4 ft. cover.....	
10	31.47	4.4	0.8	53.3	7.5	4.9	20.3	.....	0.6	0.8	7.4	Cast iron.....	2½ ft. cover.....	N. E. W. W.
11	11.32	.....	65.6	14.3	.....	.....	20.1	.....	.....	.....	.....	Cast iron.....	2 to 2½ ft. cover.....	
12	22.30	.....	21.0	66.7	7.0	2.8	2.5	.....	.....	.....	.....	Cast iron.....	3 ft. cover.	280-lb. guarantee.
13	34.26	.....	23.3	47.5	4.7	7.7	7.6	1.6	.....	.....	7.6	Cast iron.....	3½ ft. cover.....	
14	12.9	.....	49.0	33.0	8.0	4.0	.....	.....	6.0	.....	.....	Cast iron.....	3 ft. cover.....	
15	54.38	.....	4.1	69.6	8.7	8.0	2.6	1.0	3.2	.....	2.8	Cast iron.....	2½ ft. cover.....	Own specifications.
16	19.28	.....	4.8	89.1	.....	.....	5.0	1.1	.....	.....	.....	Cast iron.....	2½ ft. cover.....	300-lb. guarantee.
17	11.5	.....	.....	59.6	27.0	11.2	2.2	.....	.....	.....	.....	Cast iron.....	2 ft. cover.....	
18	30.15	2.8	7.5	61.4	14.8	9.4	4.1	.....	.....	.....	.....	Cast iron.....	2½ ft. cover.....	
19	81.38	.....	19.4	43.9	17.2	4.3	11.3	1.8	1.3	.....	0.8	Cast iron.....	3 ft. cover.....	Guarantee.
20	105.36	7.3	7.7	65.4	6.4	0.6	6.8	.....	0.4	1.0	4.4	Cast iron.....	3 ft. cover.....	Own specifications.

Twelve cities use recording gauges, two have no gauges at all, and the remainder use one or more ordinary pressure gauges.

The average of all of the cities shows one mile of main to each 740.6 population. All the pipe was cast-iron, except that two Massachusetts cities are still using some cement-lined pipe, which, however, is being replaced from time to time. Of the various sizes used, the mean percentage of each for all the cities was as follows: Less than 4-inch, 0.93 per cent; 4-inch, 18.52 per cent; 6-inch, 51.24 per cent.; 8-inch, 11.45 per cent.; 10-inch, 4.84 per cent.; 12-inch, 8.26 per cent.; 14-inch, 0.41 per cent.; 16-inch, 2.04 per cent.; 18-inch, 0.10 per cent.; larger than 18-inch, 2.20 per cent. The sizes smaller than 8-inch are seen to constitute more than 70 per cent. of the whole. The 14 and 18-inch sizes seem to be unpopular, only seven cities having any 14 and only two cities any 18-inch, although all but eight had some larger than 18-inch, most of the cities jumping from 12 to 16-inch and from 16 to 20-inch. Four cities used the N. E. W. W. Association specifications, with minor modifications; three required a guarantee that the pipe would withstand 300 pounds pressure, and one 280 pounds pressure, and two a general guarantee, while two cities have prepared their own specifications and of eight no statement was made.

Eight cities had no record of the number of valves in use, although four estimated this, and two had no record of the number of hydrants. The least lengths of main which could be cut out by the closing of valves varied from a mean of 325 feet to a mean of 3,000 feet, while the maximum lengths varied from 1,250 to 8,500; these, however, were only estimated approximations in each case. Fourteen cities place the valves on the building or street line, two cities either there or near the junction with the intersecting main, and one in the crosswalk, probably between the two lines of crossing stones. Most of them used iron valve boxes (the majority of these seemed to be the Buffalo casings) with stone or brick vaults for the larger valves. The hydrants were stated to be placed a mean of 200 to 450 feet apart, with maximum distances of 500 to 1,600 feet. The average of all cities was one fire hydrant to each 683 feet of main. Four use only 6-inch connections for fire hydrants, and all use some of these, generally leading from the larger mains. One 4½-inch and two 2½-inch outlets is the rule in four cities; two 2½-inch in fourteen cities, one 2½-inch in two cities. Valves are used on connections to larger mains in eight or nine cities, and on all recent connections in three or four. Only one city is reported to have valves on the outlets.

Not the least valuable part of these reports are the recommendations concerning improvements to be made. Although these are from the point of view of fire protection only, this by no means detracts from their value since one of the important functions of the water supply system is fire protection, and from a third to a half of the cost of most systems is expended for this purpose. Most of the recommendations practically call for bringing the plant up to a given standard determined upon by the underwriters. The standards for mains are classified under three heads: (a) outlying residence districts: (b) closely-built residence districts; (c) manufacturing and mercantile districts. They recommend for the first that no mains less than 6-inch be used, that the minimum for

	Gate Valves				City Fire Hydrants					
City No.	Number	Cut-off Sections, Feet	Location	Valve Boxes	Number	Distance Apart	Size of Connection	Size of Barrel	Size of Outlets	Valve On
1	No record	600 to 2,800	Building line.....	Larger than 14" wood; rest iron.	500	305 ft.	6"	6"	One 4½", two 2½".....	A few connections.
2	1,173	.....	Building line.....	.....	405	.....	6"	80% 4"; 20% larger.	.....	No record.
3	1,134	1,000 to 5,800	Street line.....	4"-10" iron; others brick.	676	450' to 500'	4" and 6", 8"	5", 8"	One 4½", two 2½", four 2½".	Connections to 12" mains and larger.
4	616	.....	Street line.....	4"-16" iron, 20" brick.	755	310' to 520'	87% 6"; others 4" and 8".	.....	Two 2½".....	25% of connections.
5	.....	.....	.....	.....	.....	250' to 1,000'	.....	.....	Two 2½"	
6	No record	490 to 4,225	Building line.....	24" and 30" brick; others iron or wood.	No record	200' to 1,600'	6" on 6" or larger mains; others 4".	4" to 6"	70% one or two 2½"; 30% one 4½" and two 2½".	100 on hose outlets. On connections to large mains.
7	2,500	325 to 1,250	Building line.....	.....	867	265' to 350'	.....	4" to 6"	One 4½", two 2½".....	Recent connections.
8	115	1,500 to 2,000	Building line or near intersection of mains.	Large size, brick; others iron.	170	320' to 500'	4" or 6"	4" or 6"	Two 2½", with or without one 4½".	One-half of connections.
9	Information refused.				127	380' to 450'	.....	.....	Two 2½".....	
10	No record	1,000 to 8,500	Building line or near intersection of main.	Large size, brick; others iron.	240	300' to 500'	4" or 6"	4" to 6"	Two 2½".....	Connections to 20" and 24" mains.
11	75	.....	Building line.....	Larger size, brick; others iron.	95	About 625'...	.....	4"	Fifty have two 2½"; others one.	Four connections.
12	94	1,200 to 4,000	Building line.....	6" or 8" casings.....	161	About 435'...	6" on 6" or larger mains; others 4".	5"	Two 2½".....	
13	About 260	1,500 to 2,500	Building line.....	12" and 20" brick; others iron.	237	About 435'...	4" and 6"	.....	Two 2½".....	Connections to 20" main.
14	About 100	.....	Street line.....	Iron.....	About 123	About 360'...	4"	3" and 4"	80% one 2½"; others two.	
15	387	1,350 to 2,670	In cross-walks....	Large iron boxes and brick vaults.	560	About 350'...	4" or 6"	4" or 5"	Two 2½"; ten have three 2½".	Recent connections.
16	About 70	3,000 to 5,000	Building line.....	Concrete casings.....	197	375' to 430'	6"	4" and 6"	Two 2½".....	None.
17	No record	1,000 to 3,100	.....	8" casings.....	126	About 380'...	6"	5"	Two 2½".....	None.
18	About 80	1,000 to 3,000	Street lines.....	.....	381	400'.....	4" and 6"	4" and 6"	Two 2½"; also 4½" on 6" barrel.	
19	1,030	900 to 7,000	Property line.....	24" brick; others iron.	569	300' to 445'	4" and 6"	4" and 6"	Two 2½"; also 4½" on 6" barrel.	Connections to 10" mains or larger.
20	1,165	560 to 2,500	Building line.....	Wooden boxes.....	916	.....	3" to 6"	4" to 5"	83% one 2½"; others two.	10% of connections.

the second be 8-inch and for the third 12-inch mains; and that no 4-inch mains be used on any lines supplying fire hydrants. The distribution system should be so designed that at any point there should be available, in excess of the domestic consumption, from fire hydrants within a radius of 350 feet, a fire supply in cities 11 and 12 of 1,000, 2,500 and 4,000 gallons per minute in the (a), (b) and (c) districts, respectively; in cities 13, 16 and 18 of 1,500, 2,000 to 3,000 and 4,000 gallons for the three classes of districts, respectively; and various other quantities up to 2,000, 3,000 to 5,000 and 5,000 to 10,000 for the three classes in cities 7 and 20. In the congested districts of three cities a fire supply of 10,000 gallons per minute is recommended in that radius. They also recommend numerous cross-connections and no dead-ends. The valves should be so located that the length of main necessarily cut out by closing them need not exceed 800 feet in classes a and b, or 500 class c. The valves should be inspected once in six months and records kept of the condition found and work done.

Hydrants should have 6-inch connections with a gate on each connection; should have at least one steamer outlet and one or more hose outlets, each provided with an independent gate; and should have a barrel not less than 6 inches in diameter. The interval between adjacent hydrants should not exceed 250 feet in class (a) nor 350 feet in the other districts. The threads of the hose outlets should conform to the national standard. Hydrants should be inspected at least once in two months and records kept of inspections and repairs. Indiscriminate use of hydrants by any one but the fire department should be prevented.

Electrolysis and Three Wire Electric Road Systems

WHILE the Boston Elevated Railway Company has a well bonded system, electrolysis of water mains was, some time ago, found taking place near the Harvard power station, where there is a marsh of salt water and beyond which, about a mile away, is the first car track in that direction. The local telephone company makes frequent surveys of its cables and, wherever danger of electrolysis from the railway seems probable, the railway company puts in either a negative feeder or a connection to the rail. On its own cables the railway company has cut the lead in many places and made special connections to avoid electrolysis. The company has made experiments on the use of the three-wire system which, realizing the practical difficulties of operating such a system, they considered not as a general remedy for these troubles but more as a matter of interest. The company operates on the two-wire, single-trolley, ground return system. For the purpose of the investigations, test wires were run from the power station in three directions for a distance of from 1.5 to 2.5 miles, and simultaneous readings were taken at several points along the line under both two-wire and three-wire operation. The observations were taken about two hours apart for a period of about one-half hour each, the endeavor being to have the loads on the individual feeder sections as nearly as possible the same during both sets of observations. In an experiment on a 2.25 mile section, in which the average total load on the two-wire section was 1,377 and on the three-wire 1,267, the return drop under two-wire operation was reduced 83 per cent. by three-wire operation. In another test of the same section, when the average load under two-wire operation was 1,561 and under three-wire 1,738, a still greater reduction was made. The potential relation between pipe and rail under two-wire operation was reduced very materially under three-wire, although at the same time the pipe was rendered positive throughout the whole length by a gradual decreasing amount, whereas previously it had changed from positive to negative at about one mile from the station. Measurements of the amount of current flowing on the pipe under two-wire was in one case 42.8 amperes, with a maximum of 70, while under three-wire operation this was reduced to an average of 6.3 amperes, with a maximum of 20. In another test an average of 106 amperes, with a maximum of 155, was reduced by three-wire operation to an average of 16.5 amperes, with a maximum of 55; and in still another case an average current of 51 amperes, with a maximum of 70, was reduced to 6 amperes, with a maximum of 20. The results in each of these current measurements were taken at a different point on the pipes, the current being calculated from the resistance of the pipe and the potential drop along a single length, not including joints. It is seen that three-wire operation showed a reduction in amount of electric current flowing on the pipe of from 85 to 88 per cent.

Water Works, Archangel, Russia

THE water works of Archangel offer many extremely interesting features, because of the peculiar conditions due to the geographical position of this city. In addition there may be some points in connection therewith instructive to others in less cold climates; since the extreme conditions in Archangel may have compelled the development of plans which would be beneficial in somewhat less frigid countries, but which have not been there worked out because their actual necessity was not so imperative.

This city is situated within 2° of the polar circle and the climate is subject to very great contrasts. The average yearly temperature for the last twenty years has been 32.5° F., with a maximum of 93.9° and a minimum of 53.5°. The river is covered with ice from October until the end of April. The length of the day varies from four hours in December to twenty-one hours in June. The soil of the town is moist and marshy and in the winter time freezes to the maximum depth of five feet, but during the summer all of the frozen soil thaws, thus permitting the laying of the mains. At the outskirts of the town, however, clay comes to the surface and in this the frost reaches to a depth of nine feet three inches. In the former soil pipes are laid at a depth of six feet three inches, and in the latter at a depth of twelve feet ten inches. During the three years of the

existence of the water supply systems there has been no case of frozen mains. The town contains 1,150 buildings of one or two stories, arranged almost entirely in one long stretch. There is no sewage system nor any probability of there ever being one, each house being provided with a cesspool. There is usually only one tap in each house, placed in the kitchen. Washing is done in the river; in winter holes are made in the ice for this purpose and kept clear by attendants who get a certain payment from each family. Watering the streets is unnecessary during the short summer time, as the ground is sufficiently moist without it; in fact, a horse may easily be drowned within a few yards of the outlying houses of the settlement, where the streets end in the marsh. These facts help to explain the exceedingly small average consumption of water, which is but 6 1-2 gallons per capita per day.

The waterworks are owned by the town. Owing to the fact that water is furnished to the consumers unmetered, and that 20 per cent. of the daily pumpage is used by soldiers, gendarmes, schools, charitable institutions and hospitals, free of charge, the income does not cover even half of the expenses. The rate is 75 cents for each occupant of a house, excluding children.

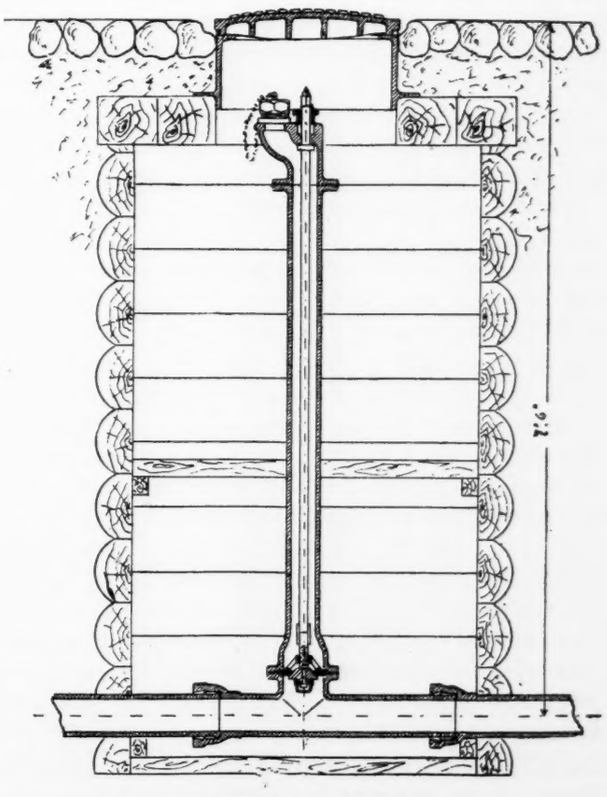
Most of the houses are raised from two to six feet from the ground and few have warm basements or cellars. The house connections must be laid with this in mind, and are carried seven or eight feet below the surface to a point just inside the cellar wall, and are then brought up vertically about two feet from this. A wooden casing with not less than 3½ by 3½ feet cross section is placed around this part of the pipe, and this box is filled with manure mixed with hay, covered with a thin layer of lime, and the last foot under the floor filled with ashes; all of which is covered by a detachable hatch, so that in case the insulating materials should settle an additional supply of the same may be put in. As it is difficult to get to the curb-cock in winter, owing to the depth of snow, a second stop-cock is placed at the entrance of the pipe into the room. An outlet is arranged in the wall of the main building, from which water may be drawn for outdoor use.

The water is obtained from the North Dwina and is free from organic impurities, tasteless and odorless, but is given a slight yellow color by the swamps on the water shed. Probably for the latter reason it is filtered through slow sand filters. The water is delivered by the direct pumping system through two lines of mains to a water tower in the center of the town, which is shut off when fire pressure is desired. The filter is covered and a three-foot thickness of earth is placed above it to keep out the frost. In the spring floating ice brings down considerable soil, which is retained in a sedimentation tank before the water is passed to the filter. In winter the filters are heated with exhaust steam from the pumps. The rate of filtration is in the neighborhood of 3,00,000 gallons per acre per day. The clear-water basin is circular, covered with a dome, and has a capacity of 32,500 gallons. The water tower consists of a tank with a capacity of 6,500 gallons, resting upon a fire watch-tower seventy-seven feet high. It is of iron one-eighth of an inch thick and is painted on the inside with carbonizing coating of the Goheen Manufacturing Co., and on the outside with red lead. In winter time the tower is heated and serves to dry the fire hose.

Eight public water supply stations are located in different parts of the town, and are intended practically for supplying water to the poorer class. Each station has a one and a half inch wall outlet for taking water by means of barrels and a one-inch pipe for taking it in pails. Water from these stations is given to the holders of tickets issued by the municipal board, gratis or for payment.

The suction pipe of the pumps is eight inches in diameter and its outer end is seven feet below the zero level of the river. The strainer and part of the pipe are surrounded with cobblestones and, as the flow of ice down the river is sometimes very powerful, the pipe is protected on the sides by piles.

The street mains consist of six and four-inch castiron pipes. As the marshy soil cannot serve as a solid foundation for the pipes, the back-filling is made in such a manner that the weight of the earth presses on only part of the pipes. This is attained by digging the trenches not as continuous ditches, but ditches fourteen feet long have intervals of four feet between them through which tunnels are dug for the pipes, there being, after back-filling, no pressure of earth upon the part of the pipe which was laid in tunnel. Fire hydrants are located at intervals of



FIRE HYDRANT, ARCHANGEL

350 feet, directly above the mains, and entirely beneath the surface, as shown in the accompanying cut. A red lantern is put up on the sidewalk opposite the hydrant, and as the streets are covered with a thick layer of snow in winter, still further means of finding the hydrant quickly are adopted. A rope is kept in the lamp post and when it is necessary to find the hydrant it is stretched to a post on the opposite side of the street, in which position a lead ball, fastened to the rope, comes directly over the hydrant. This is additionally desirable because in winter time the moon and the reflection from the snow furnish the only street lighting. The cost of six-inch pipe is given as 63 cents per foot; that of trenching, digging bellholes and back-filling 19 cents, lead 3 cents and laying and making joints 6 cents. The hydrants cost $48 apiece and the forty-nine gate valves $40 apiece. The cost of the entire plant was $71,329.86. The thickness of the pipe is obtained according to the formula $t=.02D+6.5$ mm. ($=.02D+0.256$ in.).

The above account is condensed from a paper contributed to the American Society of Municipal Improvements by Mr. Ulrich E. Taubenheim, manager of the waterworks.

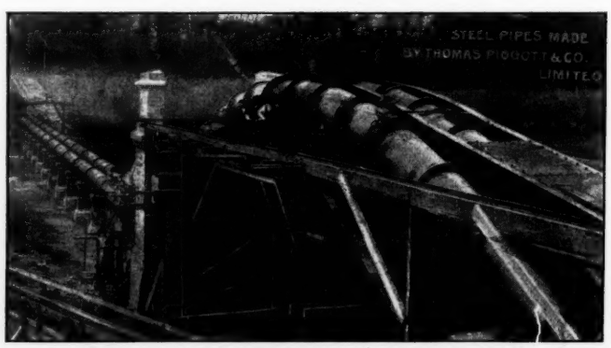
Iowa's Uniform System of Municipal Accounting

ON April 5, 1906, there was approved an act providing for municipal accounting which is required to be adopted in all cities and towns of that State on and after April 1 of this year. The results of this will not, of course, be available for more than a year to come, and consequently cannot yet be used as an argument in favor of such a law. To most of those who have to deal with statistics, however, such argument is not required and it hardly seems possible that advantages will not be realized from a law of this kind, however imperfect, which would not be obtained under the present confusion of methods and lack of method.

This act provides that the chief accounting and warrant issuing officer of each city and town (auditor or clerk) shall prepare and publish the annual report of its financial condition and transactions, and that all boards, departments and offices of a municipality which handle public funds shall, within 30 days from the expiration of their fiscal year, file a report of their transactions in a form prescribed by law; failure to file such report being made a misdemeanor, and the auditor or clerk are to institute legal proceedings to enforce such reports. If the city has 5,000 population or more, the annual report must be printed in pamphlet form, at least 500 copies being printed at the expense of the city. In smaller cities the publishing of pamphlet reports is optional. On or before the first day of July a certified copy of the report shall be forwarded to the State auditor, who shall print, on or before December 1, 3,000 copies of a State report containing the reports of all the cities and towns of the State. To insure uniformity, the State auditor shall formulate and prescribe a system of municipal accounts, in preparing which he shall be assisted by an advisory committee of from five to seven municipal accountants, in which it shall be the endeavor to adopt, as far as practicable, the latest and most improved methods of municipal accounting. The auditor shall appoint one or more examiners of municipal accounts, who shall, at least once in two years, examine, audit and report upon the financial conditions and transactions of all cities of 5,000 population or more, these examiners having the customary power over witnesses, etc. The compensation of said examiners is fixed at the ridiculously inadequate sum of $5 per day. Any city or town of less than 5,000 population may have its finances examined and reported upon by the State examiner upon application; also, upon petition of 50 or more taxpayers of any city or town and the approval of the State auditor, special examinations may be made for stated reasons.

Steel Pipe Canal Crossing

IN bringing the new water supply to Birmingham, England, it was necessary to cross the ship canal at Cookley, and an interesting and unique construction was made there, as shown in the accompanying illustration. There are two lines of pipe each 41 1-4 inches internal diameter; the thickness of the steel plates is 11-16 of an inch and the joints are lap-welded. In order to give head room over the canal it was necessary to carry the pipes either under it or over it at a considerable height. The second method was adopted, and an arch was made with the span between skewbacks of 106 feet 10 inches and a camber of 13 feet 8 1-4 inches. Each line of the piping consists of fifteen sections joined by flanges, between which are joint rings of India rubber, circular in cross section, which are fitted in diamond shaped grooves in the flanges, so that the joints when drawn together are locked in position. An air valve is provided at the highest point of each line of pipe, a provision for cutting it off from the pipe to permit of examination is made. The skewbacks are of cast iron, strongly ribbed and fixed in the masonry abutments. Suitable wind-bracing is placed between pipe line and abutments. From the abutments stone piers rise to the level of the top of the arch. Beyond the arch the pipe lines are supported as girders on stone piers across a valley of considerable width.



BIRMINGHAM AQUEDUCT OVER CANAL AT COOKLEY

Special Hydrants for Street Departments

IT has happened three times this year, according to Mr. L. C. Boyd, Vice-President of the Indianapolis (Indiana) Water Company, that inexperienced drivers of sprinkling or flushing wagons have so abused the fire hyrants that, in case of fire, it would have been impossible to use them unless repairs had previously been made. The screws on the valve-stems of the fire hydrants are left-handed, and it is a comparatively easy matter for an inexperienced man on a sprinkling wagon to break the valve or the stem by endeavoring to turn it in the wrong direction to open it. The water company proposes to furnish hydrant connections, at least in the congested districts, which would be painted a different color, have different sizes of connection and different mechanism in every way from the present fire hydrants, so that the Street Cleaning Department could not use their wrenches or hose on the fire hydrants, nor could the Fire Department use the Street Cleaning Department's hydrants.

United States Underground Water Surveys

The practical value of the underground water investigations, which have been and are being carried on by the United States Geological Survey, has recently been demonstrated in South Dakota. In this region the western extension of the Northwestern Railway system, from Pierre to Rapid City, has been built in the valley of the Red River, and the company has there sunk three wells to supply water for locomotives and other purposes. They were guided entirely in the location and sinking of these wells by the map and report of the Geological Survey on the Underground Water Resources of South Dakota. This report indicated in a general way the areas in which artesian flows might be found and showed the probable depths at which lies the great water-bearing formation of the great plain, known as the Dakota Sand Stone. The data given showed this sand stone to lie at a probable depth of 1,510 feet at Capa, and it was found there at 1,500 feet. At another point, where it was stated to lie somewhere between 1,500 and 2,000 feet deep, it was entered at 1,760 feet.

Some Water Meter Data

ONE of the difficulties in the way of presenting data concerning the cost and maintenance details of waterworks appliances is indicated by the size of the following table, which contains practically all of the data which we were able to find by the examination of several scores of municipal reports for the purpose of compiling it. Several cities not included in this table reported the number of connections and number of meters, but gave no further information concerning the latter. The object in view in preparing this table was to obtain an idea of the amount of work involved in maintaining meters and the cost of such work, but the results obtained are disappointing in their meagreness and non-uniformity. An attempt was made to classify the figures given for cost of maintenance under three heads—repairs, clerical and the total. In certain cases, however, it was not made very clear in the report whether repairs included also the clerical, whether total included anything besides repairs and whether the total given included also the cost of setting new meters. For these reasons the average cost per meter for repairs may not in every case be correctly represented by the figures given under that heading; which seems the more probable, because of the extra variation in these, the cost ranging from 2 cents to practically $2 in the various cities, the average of all being 49 cents per meter. The data concerning number of meters repaired appear to be somewhat more consistent, although in only a few cases were they given in the reports; the number appearing to be about from 5 per cent. to 10 per cent. of the total number of meters in service.

Name of City	Total Number of Connections	Total Number of Meters	Percentage Services Metered	Total Cost of Meters	Maintenance Cost One Year			Repairs: Average Cost per Meter In Use	Number Repaired One Year	Remarks
					Repairs	Clerical	Total			
Boston, Mass.	90,360	5,341	6	.....	.....	.....	.....	.....	373	
Detroit, Mich.	73,699	6,346	8	$110,966	.....	.....	$1,664	$0.26	.....	Total amount spent in meter department from 1889 to 1906, $247,352.
Buffalo, N. Y.	68,208	1,686	25	101,266	$3,281	.....	35,007	1.94	.....	
Cleveland, O.	65,766	44,714	68	406,024	11,729	.....	.....	0.26	.....	
Cincinnati, O.	39,601	4,406	11	.....	.....	.....	8,403	.....	74	
Louisville, Ky.	26,333	1,988	8	40,917	.....	.....	.....	.....	.....	
Kansas City, Mo.	24,697	11,344	45	.....	.....	.....	.....	.....	1,704	3,504 meters tested.
St. Paul, Minn.	22,234	8,909	40	170,761	.....	.....	.....	.....	1,074	
Reading, Pa.	19,900	1,497	7.5	41,681	1,094	1,364	2,449	0.73	.....	Average diameter of meter, 0.89 inch.
Harrisburg, Pa.	13,879	10,043	73	.....	853.25	.....	.....	0.85	491	
Lowell, Mass.	11,451	8,030	70	.....	3,518	.....	.....	0.43	.....	
Springfield, Mass.	10,946	4,477	41	.....	461.27	.....	.....	0.10	.....	
Malden, Mass.	6,669	4,670	70	.....	147.20	3,713	3,860	0.03	.....	429 meters, 2 and 3 years old, repaired and cleaned, for $600. All services now metered.
Haverhill, Mass.	5,796	713	12	.....	15.40	.....	155.93	0.02	.....	
Newport, Ky.	5,499	1,085	20	.....	.....	.....	.....	.....	65	
Atlantic City, N. J.	5,150	4,038	78	71,135	.....	.....	.....	.....	.....	
Madison, Wis.	4,100	3,865	97	56,124	.....	.....	.....	.....	.....	
New London, Conn.	3,726	395	10	.....	551.25	354.94	906.19	1.39	.....	
Leominster, Mass.	2,522	1,060	40	22,630	86.67	.....	.....	0.085	.....	
Oberlin, O.	888	590	80	.....	70.25	.....	.....	0.12	.....	
Middleboro, Mass.	886	414	47	.....	56.87	30	.....	0.13	.....	
Attleboro, Mass.	.....	1,875	.....	.....	479.27	.....	.....	.....	.....	
New Brunswick, N. J.	.....	273	.....	15,248	.....	.....	.....	.....	.....	
Nashville, Tenn.	.....	4,995	.....	.....	716.73	.....	.....	.....	.....	
Norwich, Conn.	.....	183	.....	.....	.....	.....	.....	.....	22	

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Water Meters in France

THE *Technique Sanitaire* of a recent date discusses the subject of water meters from the French point of view. "It is well known," says that journal, "that managements which charge consumers for water not according to the quantity actually delivered, but in accordance with various standards, including the number of the users of their domestic animals, the area of their real estate, rental value of their dwellings and even more fantastic methods of valuation, cannot establish any equitable ratio by these means. We also know that to protect themselves against abuses some managers have adopted the most vexatious methods of restricting the consumption where this is practicable. As a matter of fact it has been the general rule not to limit too far the volume of water supplied, for fear that after a few years the plants would be insufficient in capacity even though most generously proportioned for the earlier conditions.

"What method could be more legitimate and more just than for the consumer to pay for what he received and the purveyor to receive the exact price for that which he furnishes? To this principal there could be no objection, but its application does not appear to have received as ready endorsement as the theory. It thus came about

that for several years waterworks managements took a deep interest in technical discussions not only of methods of distributing water, but also of appliances designed to measure the quality supplied. Not to go back too far, we will refer to the remarkable work published by the National Conservatory of Arts and Trades of Paris, over the signatures of MM. Perot and Michel-Levy, which is an account of tests truly scientific and practical made on more than 100 meters of eighteen different types by means of a perfect equipment and the most exact methods. Municipal experts as well as the employees of private companies will find in this work important information, enabling them to select, according to their special requirements, including the quality and cost of the water at command, the appliance best adapted to requirements.

"A short time afterwards M. F. Brocq called a conference on meters in general to be held at Paris; and nothing gives a better idea of the interest the subject aroused than the number of persons brought together in the Rue Blanche on June 1, 1906, by the announcement of this exhibition. On the 19th of October, of the same year, a similar assemblage was accorded equal attention. Another important contribution to the study of this question is furnished by a recent work entitled 'The Water Meter,' by Adolphe Claus and Paul Poinsard, who have studied and analyzed the delicate apparatus employed in recent years from the standpoint of their actual use in service. In comparison with the archaic and arbitrary systems of valuation or restriction above referred to, the water meter alone is capable of equitably keeping account between the customer and the purveyor. Placed in the service pipe of the customer it enables him to take the water under the pressure maintained in the public mains, when he wants it, according to his needs, without any restrictions except that he pay according to the record of the meter. Thus the choice of a meter interests not only all water supply managements, but also the consumers. In the work last mentioned, the reader will find an analysis of the 'speed meter' (inferential meter) extensively employed in the large European cities. In France its use has been somewhat limited, the early appliances not having furnished satisfactory results because of imperfections in their construction, which are nowadays successfully avoided. The authors show by recent statistics obtained in cities which have adopted this meter and which employ it exclusively that these devices are giving perfect satisfaction. During the forty years since these meters were first proposed, great progress has been made in the manufacture of instruments of precision and manufacturers are now in a position to furnish 'speed meters' which are, in sensitiveness, accuracy and durability, capable of competing to advantage with any of the other meters described in this work. A number of pages are devoted to the subject of 'tests to which meters may be subjected,' these tests being those of accuracy, endurance, length of life, etc. Reference is made in this work to the testing laboratory connected with the National Conservatory of Arts and Measures where experiments can be made to determine the requirements under these various heads which a satisfactory meter should meet.

Record-Keeping on Street Paving

An illustration of record-keeping in connection with work on street paving is given herewith to show what can be done in this line and as a good illustration of one way of doing it. The Southern Paving and Construction Co. contracted with Hattiesburg, Miss., to lay brick paving on six-inch concrete for $1.58 for the brick (including filler), $0.65 for the foundation, and $0.39 per cubic yard for excavation. The Southern Bitulithic Co. also contracted to lay bitulithic for $1.65 for wearing surface, $0.45 for four-inch concrete foundation, and $0.60 for six-inch, and $0.40 a cubic yard for excavation. A daily record was kept by the city engineer of the actual construction work upon the form below, which has been filled in for May 1.

It is naturally impracticable to keep daily quantity records so accurately as to permit any definite conclusions as to unit costs to be drawn from them. But the daily records as to force, material, etc., if kept throughout a contract or work on a given kind of construction, so as to permit not only the proper distribution of gen-

DATE, MAY 1, 1907 — KIND OF PAVING, BRICK

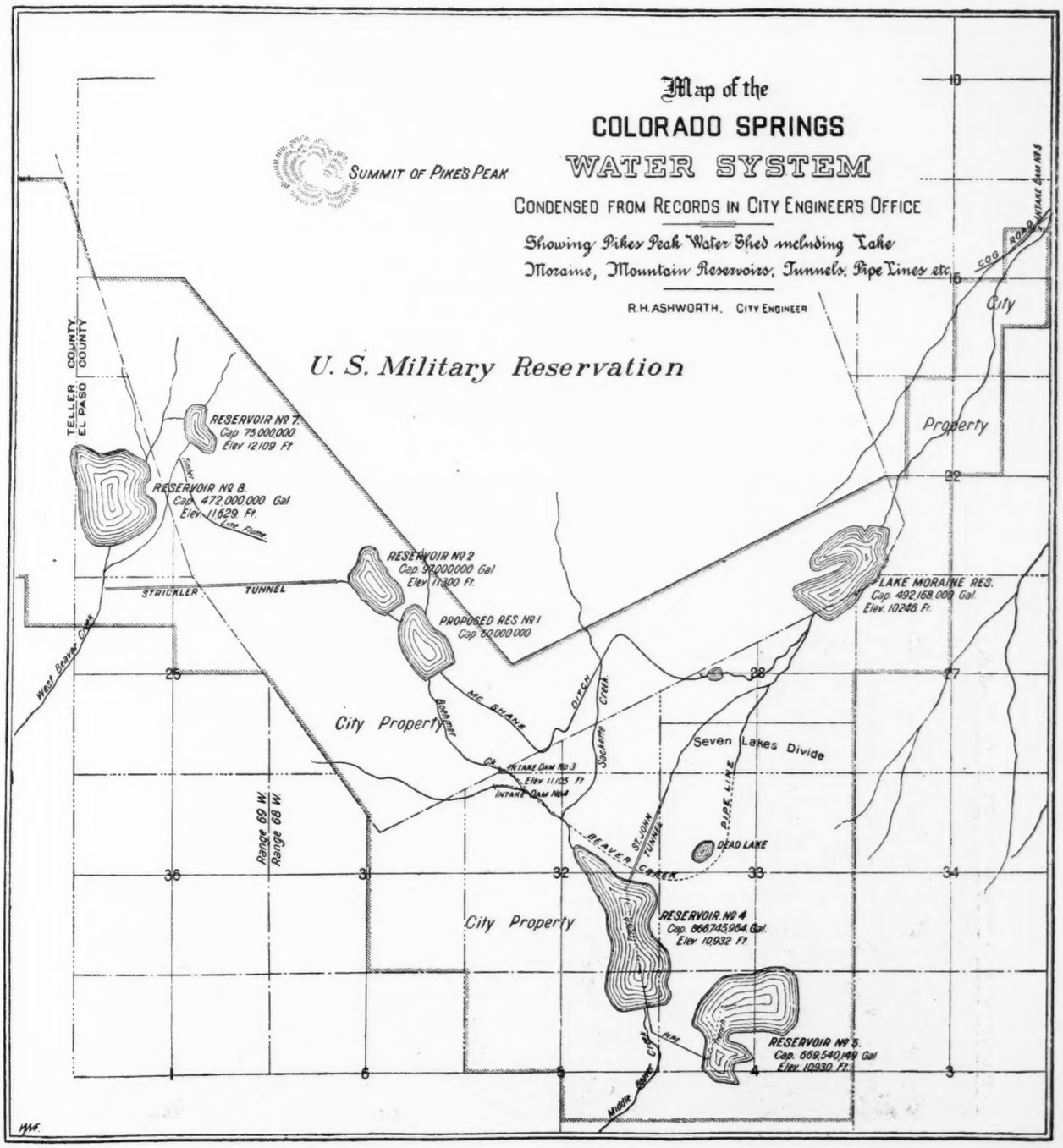
	Excavations						Concrete Foundations								Cushion		Wearing Surface			Filler				Cost Per Square Yard					Contract Price		
Street	Ave. Width (ft.)	Ave. Depth (ins.)	No. of Cubic Yards	Labor (hrs.)	Teams (hrs.)	Ave. Haul (yds.)	Width (ft.)	Depth (ins.)	No. Sq. Yds.	Labor Mixing (hrs.)	Labor Placing (hrs.)	Labor Tamping (hrs.)	No. Barrels Cement	No. Yards Sand	No. Yards Gravel	Sq. Yards	Labor (hrs.)	Labor (hrs.)	No. Square Yards	Cost of Rolling	Square Yards	Labor (hrs.)	Foreman (hrs.)	Water Boy (hrs.)	Excavation (cubic yards)	Concrete Foundation	Wearing Surface	Filler	Total Cost of Completed Pavement	Excavation	Concrete	Wearing Surface
Main.....	42	12	215	210	100	230	42	6	265	100	60	10	46	15	31	265	10	55	290	$5	290	10	15	15	$0.405	$0.70	$1.19	$0.07	$1.96	$0.39	$0.65	$1.58
Pine.....							37	6	300	80	50	10	52	18	32	300	12	64	300	5	430	20	25	25	.....	0.67	1.17	0.10	1.94	.....	0.65	1.58
Front.....							37	6	400	60	40	10	66	25	42	300	15	50	300	15	300	15	23	23	.....	0.615	1.16	0.07	1.84	.....	0.65	1.58
KIND OF PAVING, BITULITHIC																															
Bay.....	30	15	145	90	90	350	30	4	780	120	40	20	88	34	56			130	780	$15			30	30	$0.34	$0.43	$1.45			$0.40	$0.45	$1.65
Main.....	27	17	162	90	50	200	27	4	500	110	40	20	69	24	40			130	500	15			20	20	0.35	0.515	1.45			0.40	0.45	1.65
Mobile.....							27	6	221	78	39	8	33	14	23			70	221	10			10	13		0.655	1.45				0.60	1.65

eral expenses (such as collection and removal of plant, non-uniform conditions, etc.), but also an accurate measurement of the work performed, would not only give the city an idea of how much a given contractor was making or losing on his contract (information of little value in itself), but also enable them to decide, in the case of future contracts, whether the bids submitted were reasonable or not. Allowance should, of course, be made for interest on and depreciation of plant, profit (ten per cent. may be sufficient for this where there is no risk whatever, but generally fifteen per cent. to twenty-five per cent. is a fair allowance), cost of bond, of getting plant to and away from the job, and their general expenses.

COLORADO SPRINGS WATER SUPPLY

Pikes Peak Water Shed—Natural Reservoirs—Tunnels and Pipe Lines—Board of Health Approve the Quality of the Water.

THE water supply system of Colorado Springs, Col., is divisible into three sub-systems—the mountain, transmission and distributing system. The mountain system consists of two reservoirs on the east fork of West Beaver Creek, the water from which is brought to Boehmer Creek shed by means of the Strickler tunnel. A short distance below the eastern portal of the tunnel is reservoir No. 2; and still further east and below the conflu-



ence of Boehmer Creek and Middle Beaver Creek are located two other reservoirs occupying the Seven Lakes basin. From these the water is brought to Ruxton Creek shed and Lake Moraine by means of the Beaver Creek pipe line and the St. John tunnel. From Lake Moraine the water flows in an open channel to the main intake, which also receives the water from Lion Creek. In the same vicinity are intakes receiving water from three other creeks. The total storage capacity of all of these reservoirs is estimated at 2,696,410,000 gallons; the largest reservoir having a capacity of 864,544,810 gallons. The total capacity of the reservoirs when full is sufficient for about nine months' consumption.

The elevation of the highest reservoir is 12,099 feet. Strickler tunnel, through a spur from Pikes Peak, is 2,480 feet long and 4 feet by 7 feet in cross-section, and was completed in November, 1900. St. John tunnel is 2,385 feet long. It was constructed in 1903 and 1904 and cost $61,142. All of the reservoirs are connected by telephone, and good roads reach all of them except the two reservoirs first mentioned. The total cost of the mountain system was about $500,000.

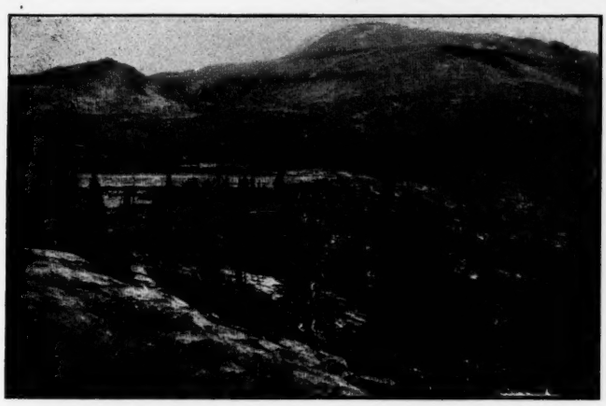
The water shed is limited to the Pikes Peak region, and ranges in altitude from 8,000 to 14,000 feet. This water shed is supposed to cover about twenty square miles, and an estimated run off of sixty per cent. of the lowest yearly precipitation would yield on this assumption 500,000,000 cubic feet of water per year, or about fifty per cent. more than the present consumption. Although a great deal of the precipitation occurs in the form of snow, which results in a less loss from floods than would be the case on many water sheds, it is thought

RESERVOIR NO. 2

desirable to locate and construct large storage reservoirs to permit utilizing practically all the precipitation.

The quality of the water is believed to be excellent, the location of the greater part of the system being such that it can be protected from pollution much more easily than can most drainage areas. The entire mountain system is practically enclosed by a barbed wire fence, which prevents the entrance of cattle thereon for grazing. The Commission of Public Health last year examined the beds of streams, the character of the soil upon the banks and over the proposed reservoir sites, and has taken samples of water from every creek, reservoir and tunnel in the system. The Health Department maintains an inspector throughout the working months of the year in the mountain section, patrolling the stream, looking after the sanitation of the construction camps, and previous to the construction of the fencing he patrolled the valleys to keep off the cattle. Analyses of water taken from the taps in Colorado Springs during July to December of last year showed from 58 to 178 bacteria per c.c.; from 2.00 to 2.54 grains per gallon of total residue, of which

RESERVOIRS NOS. 4 AND 5 FROM SUMMIT OF MOUNT BALDY



RESERVOIR NO. 8 PIKES PEAK

0.61 to 0.71 were organic residue; the maximum amount of ammonia found was .00735 part per million; of albuminoid ammonia .01135; and no nitrogen was found as either nitrites or nitrates. The percentage of oxygen saturation averaged from 98.88 to 99.67. The chlorine averaged from 0.632 to 1.020. All of these are parts per million.

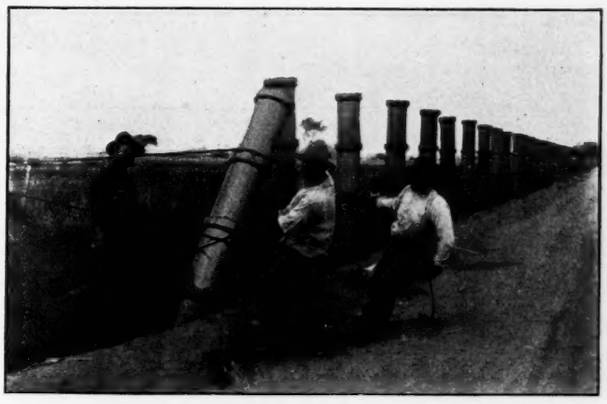
The transmission system consists of the Ruxton Creek pipe line of 14 and 16-inch pipe, which follows the line of the Pikes Peak Railway to the settling basin in Manitou. Its carrying capacity is estimated at 17,000,000 gallons per twenty-four hours. However, the city supply has been brought through the 21-inch pipe line of the Pikes Peak Hydro-Electric Co., except when their plant was not running. From the Manitou settling basins water is brought in one 8-inch, one 16-inch line to the city; the combined capacity of these being estimated at 6,500,000 gallons per day. There is also a 10-inch line from Bear Creek estimated to deliver 1,000,000 gallons per day.

The distributing system consists of pipe lines from the High Line and Mesa reservoirs to the city and the surface mains laid within the city. In the domestic supply system are included 115.9 miles of 20-inch to 1½-inch pipe, almost one-half of which is 6 and 4-inch. There had been made previous to January 1, 1907, 10,822 taps, on which were 116 meters. There are 353 fire hydrants in the city; and 36 hydrants in Colorado City and Manitou are supplied from the system also.

Vitrified Pipe Water Conduit

A PIPE line for carrying water, made of sewer pipe, which showed no leakage when subjected to a pressure test of thirty-four pounds to the square inch, is, we believe, something of a novelty. Such a line was laid in connection with the waterworks of Hobert, Okla. This line is about three miles long and has in this distance a fall of twenty-four feet. It was laid to conduct water from springs to the municipal pumping plant, and passes under creek beds and over some small hills, following the natural slope of the ground, and at several points is subjected to static pressure of about fourteen pounds. It has two valve openings at its upper end, one 4-inch and one 8-inch. The flow of water is regulated at these upper openings by an employee who resides a short distance from the springs. At the lower end the pipe line discharges freely into an open reservoir, from which point it flows to the pump. The conduit has been in use for about four years, and is said to have given perfect satisfaction.

The line is composed of 12-inch vitrified pipe, double strength, furnished by the W. D. Dickey Clay Manufacturing Co., of Kansas City, who used special care in selecting the pipe for this line. The pipe was furnished in lengths of 2½ feet and sockets 3 inches deep; sockets and spigots both being corrugated. It was provided in the specifications that at least four joints should be made with the pipe standing vertical in the trench, and that



PIPES WITH JOINTS COMPLETED

it should then be carefully lowered and the joints connecting these sections be made in the trench. The joints were made by taking a roll of U. S. Navy oakum and calking it into the joint, using proper calking tools to drive the gasket into place and care being taken that the space was entirely closed to prevent the liquid from running into the pipe. The jointing material was composed of a mixture of one-third pure asphalt, one-third crude asphalt and one-third petroleum, with a little granulated lime added to stiffen the mixture, which was heated to about 200° and then poured into the joints. The joints made in the trench were poured by the use of a clay roll similar to that used in lead joint construction.

Experiments on the jointing material were made during one winter, the pipes being subjected to freezing temperature and then to a temperature of about 130°; the joints being subjected to a water pressure of thirty-four pounds to the square inch during these experiments without showing any leakage.

The cost of the pipe line laid complete was 72 cents per lineal foot. The contract was let in combination with the rest of the waterworks plant, and other bids for this particular item were received as low as 54 cents per lineal foot. The cost of the work shows a considerable saving over any other material known which would secure satisfactory results. The surveys, plans and specifications for this work were made by Burns & McDonnell, of Kansas City, and were submitted to the Interior Department of the United States for approval, which was given them and the construction was supervised by the engineers of the United States Geological Survey.

MUNICIPAL BOND SALES

Data Concerning Sales of Municipal Bonds During April by Cities of Less than 100,000 Population—Financial Statistics of Cities Listed

Believing that such information as is contained in the following table is of interest and value to Mayors, Comptrollers and other city officials, it is the intention of the MUNICIPAL JOURNAL AND ENGINEER to publish, in the first issue of each month, similar data covering the successive months.

NAME OF CITY	Estimated Population	ACTUAL VALUE OF ASSESSABLE PROPERTY (estimated)		Ratio of ass'd to actu'l v'lue	Bonded Debt	Sinking Fund	NET BONDED DEBT		Tax Rate per $1,000 Ass'd Value	BOND SALES, APRIL, 1907				Basis
		Total	Per Capita				Total	Per Capita		Term of Years	Amount	Interest	Price	
Pueblo, Col.										10-20 opt.	$136,000	4½%	$100.22	4.472
Gainesville, Fla.	6,000	$2,500,000	$417.	.33	$115,000				$2.00		10,000	5% s.a.	Par.	
Plant City, Fla.										20	30,000	6% s.a.	101.027	5.914
Edgewood, Ga.										30	12,500	5%	106.06	4.624
Evansville, Ind.	75,000	60,000,000	800.	.50	1,968,000				10.40	1-10 ser.	132,000	3½% s.a.	100.50	3.40
Colgate, I. T.	5,500	1,000,000	182.	.75	72,000	2,000	$70,000	$12.73	20.00	20	72,000	5%	Par.	
Cedar Rapids, Ia.	31,000	20,000,000	645	1.00	727,000				10.50	1-25 ser.	125,000	4% s.a.	Par.	
Glenwood, Ia.	2,505	1,287,000	514	.25	10,000	None	10,000	3.99	64.10	50	11,000	5%	104.46	4.765
Manning, Ia.										5-10 opt.	24,000	6%	105.25	4.806
Mineral, Kan.										20	10,000	6%	Par.	
Yates Center, Kan.										5½ avg.	10,000	4½%	Par.	
Bowling Green, Ky.	12,500	5,333,000	427	.75	174,000	5,000	169,000	13.52	13.00	30	45,000	4% s.a.	100.344	3.98
Flemingsburg, Ky.	1,250	1,300,000	1,040	.50	5,000	700	4,300	3.44	6.00	1-10 ser.	5,000	5% s.a.	102.22	4.53
Alexandria, La.	15,000	20,000,000	1,333	.08	128,000		128,000	8.53	15.00		35,000	5%	Par.	
Gloucester, Mass.	26,121	21,699,042	830	.75	1,742,704	142,742	1,599,962	61.25	17.50	13 avg.	40,000	4% s.a.	100.26	3.974
Tisbury, Mass.										18½ avg.	95,000	4% s.a.	Par.	
Upton, Mass.										1-10 ser.	12,000	4%	Par.	
Pontiac, Mich.										1-7 ser.	6,000	5% s.a.	100.733	4.796
Saginaw, Mich.	60,000	36,000,000	600	.67	2,094,503	42,000	2,052,503	34.21	13.35	3½ avg.	22,000	4% s.a.	Par.	
Osyka, Miss.	1,050	400,000	381	.80	None	None	None	None	8.50	20	10,000	6%	102.00	5.833
Bertrand, Neb.	650				1,200		1,200	1.85	10.00	5-20 opt.	12,000	5%	Par.	
Lincoln, Neb.	55,000	35,250,000	641	.20	1,224,100	None	1,224,100	22.26	39.25	1-10 ser.	64,370	5%	100.276	4.942
Tilden, Neb.	900	750,000	833	.20	18,000	None	18,000	20.00	25.00	10-20 opt.	18,000	5% s.a.	Par.	
Bound Brook, N. J.	5,000	2,320,000	464	.67	None	None	None	None	17.00	20-30 ser.	14,000	4½%	103.17	4.30
										13⅔ avg.	36,000	4½%	Par.	
										31-36 ser.	12,000	4½%	103.54	4.31
Hoboken, N. J.										20	20,000	4% s.a.	100.03	3.997
Ridgewood, N. J.										15⅓ avg.	60,000	5% s.a.	104.077	4.622
Corning, N. Y.	15,000	7,000,000	467	....	299,994				21.86	1-3 ser.	4,454	5%	100.26	4.863
										5-14 ser.	100,000	4% s.a.	100.026	3.996
Cortlandt, N. Y.	12,500	7,000,000	560	.85	240,000	None	240,000	19.20	15.60	15 mos.	8,368	4%	Par.	
Gloversville, N. Y.	20,000	12,780,000	639	.60	609,200	56,850	552,350	27.62	13.60	2½ avg.	6,750	4½%	Par.	
Mamaroneck, N. Y.	5,000				215,000		215,000	43.00	7.33	5-29 ser.	60,000	4.35%	100.025	4.348
No. Olean, N. Y.	11,000	3,860,235	351	.75	137,350	None	137,350	12.49	9.00	2-26 ser.	60,000	4½%	100.15	4.485
Poughkeepsie, N. Y.	26,000	20,000,000	770	.65	1,585,000	None	1,585,000	60.96	26.50	20	2,000	4% s.a.	100.50	3.964
										20	8,000	4% s.a.	100.25	3.981
										20	30,000	4% s.a.	Par.	
Tuckahoe, N. Y.	1,850	2,500,000	1,351	.40	70,000	None	70,000	37.84	8.50	5-26 ser.	11,000	5%	100.163	4.084
Utica, N. Y.										1-6 ser.	30,832	4% s.a.	Par.	
West Seneca, N. Y.										16 5/6 avg.	225,000	5% s.a.	106.27	4.465
Yonkers, N. Y.	68,000	60,019,750	882.64	....	5,018,682	299,600	4,719,082	69.40	24.48½	3	8,345	5% s.a.	100.52	4.811
										2¾	51,750	5%	100.595	4.764
Charlotte, N. C.	35,500	60,000,000	1,690	.20	1,140,000	None	1,140,000	32.11	10.00	30	175,000	4½% s.a.	97.50	4.655
Lumberton, N. C.	2,500	2,000,000	800	.50	25,000	4,000	21,000	8.40	11.10	20-30 opt.	25,000	5½%	100.20	5.483
Dickinson, N. D.	4,500	2,000,000	444	.33	23,000					20	26,000	4%	Par.	
Antwerp, O.	1,400	500,000	357	.40	14,000	8,000	6,000	4.29	56.00	11⅔ avg.	8,000	4% s.a.	100.11	3.988
Batavia, O.	1,200	800,000	666	.45	41,260		41,260	34.38	37.00	30	5,900	4%	101.555	3.911
Beach City, O.										5	1,100	5% s.a.	Par.	
Bryan, O.	4,000	3,000,000	750	.33⅓	93,000	10,000	83,000	20.75	4.96	8⅔ avg.	30,000	5% s.a.	102.50	4.648
Cambridge, O.	12,000	10,000,000	833	.33⅓	317,000	6,000	311,000	25.92	3.52	20	27,000	4% s.a.	102.265	3.836
										1-10 ser.	55,955	4½%	101.607	4.17
Celina, O.	3,500	3,534,070		.33⅓	439,961	32,586			43.50	3½ avg.	6,000	4½% s.a.	100.893	4.30
										5½ avg.	22,000	4½% s.a.		
Chicago Junction, O.										1-10 ser.	12,000	5% s.a.	104.25	4.128
Delaware, O.	11,000	7,000,000	636	.56	214,584	14,365	200,219	18.20	31.70	5½ avg.	6,260	5% s.a.	104.911	3.997
East Cleveland, O.	7,000	12,000,000	1,714	.30	300,000	15,000	285,000	40.71	29.90	2 avg.	21,000	5% s.a.	101.37	4.279
Eldorado, O.	400	182,000	455	....	400				25.20	3 5/6 avg.	1,700	6% s.a.	107.026	3.996
Elyria, O.	15,000	13,000,000	867	.33⅓	866,100	70,000	796,100	53.07	38.30	5½ avg.	2,900	6% s.a.	105.374	4.415
										5½ avg.	2,100	5% s.a.		
										7 avg.	800	5% s.a.		
										7 avg.	700	5% s.a.		
Ganetsville, O.	1,450	850,000	586	.67	50,000		50,000	34.48	2.14	5-10 opt.	3,500	4% s.a.	102.21	3.515
Ironton, O.	16,000	7,500,000	469	.67	451,800	42,296	409,504	25.59	12.46	20	19,000	4% s.a.	103.50	3.496
Lakewood, O.	10,000	12,000,000	1,200	.37	1,073,404	100,504	972,900	97.29	35.95	6 avg.	34,600	5% s.a.	103.384	4.352
										3⅔ avg.	17,651	5% s.a.	103.778	3.902
Lancaster, O.	10,000									17⅔ avg.	25,000	4% s.a.	102.39	3.812
Leesburg, O.	1,000	700,000	700	.50	16,000	756	15,244	15.24	32.00	14½ avg.	4,000	4% s.a.	103.40	3.69
Madisonville, O.	4,500	2,000,000	444	.60	120,000		120,000	26.67	3.68	1-10 ser.	1,500	4% s.a.	Par.	
Mt. Orab, O.										1-7 ser.	700	5%	100.714	4.816
Mt. Washington, O.	1,000	400,000	400	.57	2,000		2,000	2.00	30.68	5½ avg.	1,176	5%	101.11	4.768
Norwood, O.										25	29,000	4½ s.a.	110.383	3.849
										1-10 ser.	6,100	4½ s.a.	102.53	3.983
Sandusky, O.	23,000	14,000,000	608	.50	640,000	10,000	630,000	27.39	16.92	10	22,000	4% s.a.	101.315	3.84
Springfield, O.	48,000	35,000,000	729.17	.60	1,014,827		1,014,827	21.14	27.30	10	7,906	5%	Par.	
										18⅔ avg.	40,000	4% s.a.	103.057	3.771
Wadsworth, O.										6 5/6 avg.	20,000	4½% s.a.	103.081	4.145
										6 avg.	15,000	4½% s.a.	101.713	4.174
Westerville, O.	2,000	675,000	338	.67	140,000	500	139,500	69.75	3.29	10½	3,000	4½% s.a.	102.333	4.321
Willoughby, O.	2,000	2,000,000	1,000.00	.45	78,000	2,400	75,600	37.80	2.80	5⅔ avg.	6,500	4½% s.a.	101.40	4.222
											2,000	4½% s.a.	101.05	4.193
Youngstown, O.	60,483	56,882,000	940.45	.50	1,269,112	209,167	1,059,945	17.52	29.42	6 avg.	40,000	5% s.a.	105.125	4.03
										3½ avg.	3,945	5%	102.579	4.203
										2½ avg.	2,100	5% s.a.	101.88	4.20
Pawhuska, Okla.	3,000	1,000,000	333	33⅓	32,000	None	32,000	10.67		15	20,000	6%	102.50	5.752
Prague, Okla.	1,400	40,000	28	.25	None	None	None	None	3.00	20	30,000	5%	Par.	
Ashland, Ore.	4,500	2,400,000	533	.67	93,000	None	93,000	20.67	23.00	1-10 opt.	1,300	6%	101.08	4.88
										1-10 opt.	475	6%	102.08	3.86
Reading, Pa.	95,000	70,000,000	737	.67	1,201,000	180,588	1,020,412	10.74	10.00		34,908	4%	Par.	
Allendale, S. C.	1,500	750,000	500	.33⅓	None	None	None	None	2.50	30	10,000	6% s.a.	102.78	5.80
Anderson, S. C.	12,000	10,000,000	833	.25	209,000		209,000	17.42	19.10	43⅓ avg.	75,000	5%	105.333	4.777
Bristol, Tenn.	18,000	9,000,000	500	.45	425,000		425,000	23.61	15.00	30	280,000	5% s.a.	Par.	
Amarillo, Tex.	10,000	3,500,000	350	....	70,000		70,000	7.00	6.50	10-40 opt.	1,900	5%	Par.	
Beaumont, Tex.	2,500	5,000,000	2,000	.56	None	None	None	None		20-40 opt.	130,000	5% s.a.	103.50	4.727
Dallas, Tex.										10-40 opt.	287,500	4% s.a.	Par.	
Smithville, Tex.										40	17,000	5% s.a.	101.50	4.914
Creston, Wash.	500	300,000	600	.38	5,500	None	5,500	11.00	7.00	10-20 opt.	5,000	5½%	Par.	
So. Bend, Wash.	3,500	2,000,000	571	.21	60,000	None	60,000	17.14	21.00	20	60,000	4%	Par.	
West Allis, Wis.										1-20 ser.	20,000	4½% s.a.	102.17	4.242
West Salem, Wis.	000	800,000	880	.75	14,000	None	14,000	15.55	15.00	11¾ avg.	12,000	5% s.a.	103.50	4.608

THE DISPOSAL OF MUNICIPAL WASTE

Systems and Methods, with Special Reference to American Conditions—Inventions and Patents of F. P. Smith, Benj. Boulger, W. B. Wright, Jos. G. Branch and Others—Descriptions and Illustrations.

By W. F. MORSE, Sanitary Engineer

This Series of articles, begun in the February, 1906, number, will be continued until completed and will be illustrated by original drawings, cuts, diagrams and pictures, and contain many tables valuable for reference.

The Subjects Already Treated by the Author Are:—

1. The Waste Collection Service in American Towns; Methods and Results.
2. Definition of Terms; Quantities; Proportions; Character of Waste in General.
3. Garbage; Analysis; Proportions; Values.
4. Dry Refuse and Rubbish; Quantities and Treatment.
5. Classification:—Commercial Values after Recovery.
6. The Refuse Utilization Stations in New York, Boston, Buffalo, and Brooklyn (illustrated).
7. Municipal Ashes; Analysis; Proportions; Values when Separated.
8. Ashes from Cremation of Garbage; Analysis and Values; Comparative Table.
9. Comparison of Ashes from English and American Cities; Cremation Means.
10. The Utilization of Municipal Waste in General; English and American Methods.
11. Commercial Values of Refuse and Ashes when Marketed and Manufactured.
12. The Analysis of Garbage; Tankage, Its Value (Special Tables).
13. The Garbage Disposal Plant, Cleveland, Ohio.
14. Street Sweepings; Fertilizing Value and Treatment.
15. Comparative Commercial Values of Waste.
16. Foreign Destructors; Special Chapter by an Eminent Authority.
17. The first Garbage Cremators.
18. Official Reports on Cremators.
19. Chronological List of American Crematories from 1885.
20. List of Government and Institutional Installations.
21. Consolidated Tables of Installations; Hygiene and Sanitation.
22. Types of Furnaces; the Operating American Furnaces (fully illustrated). Continued.

The Following Are to Appear:—

23. Calorific Value of Waste as Fuel (comparative table).
24. Reduction and Extraction Process Described and Illustrated; the Earlier and Later Methods.
25. American Methods; Col. Waring and His Successors.
26. Present Situation in This Country; Résumé.
27. Means for Improvement as Suggested by Several Investigators.
28. What May Be Expected of the Future.

The Municipal Engineering Company

THE Municipal Engineering Company, of New York, was organized in 1901 by Messrs. F. Brown, Lyon, C. McFarland and Fred P. Smith. Shortly afterward, Col. Willard Young became a stockholder and president. The crematories erected by this company under the patents of F. P. Smith were at Long Branch, N. J. (the only municipal plant), and at Forts Leavenworth, Moultrie, Brady, Slocum, Meyer and at Governor's Island, New York Harbor. All these furnaces were of small size.

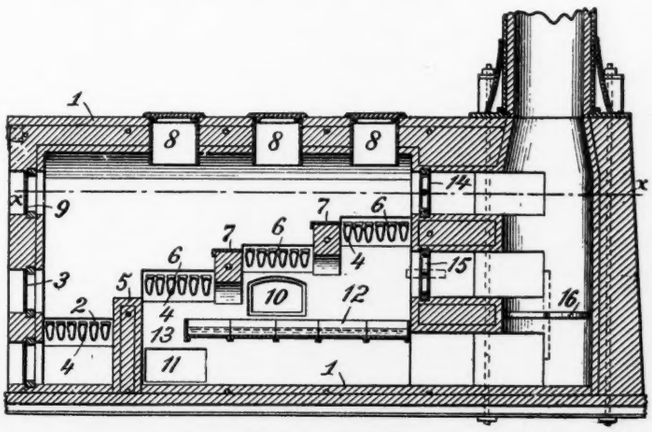


FIG. 50. LONGITUDINAL SECTION CREMATORY MUNICIPAL ENGINEERING COMPANY (1901)

Fig. 50 is a longitudinal section of the crematory of this company. The exterior walls, as a rule, are of steel plates lined with fire-brick, the general design and dimensions corresponding to the plan of the American crematories. The primary fire-box (2) at the front is a series of hollow castiron bars (4), arranged to discharge the air heated by passing through these above and behind the grate. The garbage grates are also of this same construction of hollow bars. They are placed in a series of steps, ascending from the primary fire, and separated by narrow, arched bridge walls of fire-brick (7).

Below these grates is a shallow iron evaporating pan (12), which catches the drippings from the wet material on the grates above. There are dampers (14-15) behind each set of grates, which lead to the chimney, and below the evaporating pan is a passage (13) open to the chimney, but controlled by a damper (16).

There are doors for fuel boxes and for stoking the garbage from the highest grate downward to the fire-box, where it furnishes fuel for drying and burning the successive charges. By the intelligent operation of the dampers at proper intervals, the air and heat are drawn through the garbage on the grates, carrying off the fumes and gases direct to the chimney; or by closing the dampers the gases are directed downward beneath the evaporating pan through the lower passage.

All of this interior construction, except the bridge walls and lining, is of cast-iron, the special features being the hollow grate bars, through which a current of air is induced by the stack draft, preserving the bars from giving way and providing heated air for combustion. This company was the assignee of six patents of Mr. F. P. Smith for various forms of furnaces for waste materials, but no others than the one described were built.

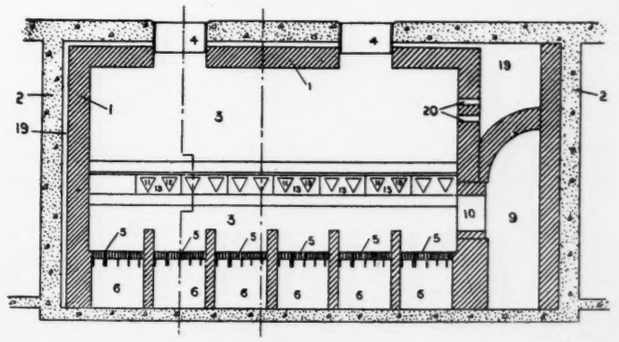


FIG. 51. LONGITUDINAL SECTION CREMATORY SANITARY ENGINEERING COMPANY (1906)

The Sanitary Engineering Company

This corporation in 1904 acquired the property and patents of the Municipal Engineering Company, the prin-

cipal stockholders being Col. Young, Mr. F. Nevins and Capt. Wm. M. Venable. They secured a patent (830,027, September 4, 1906) for an "improvement in crematories, in which garbage or refuse is burned on grates with an updraft, either with or without previous drying."

In exterior dimension and construction this furnace was nearly the same as the other, though the exterior walls may be of brick construction if desired. The garbage is charged through the ports (4) and is received on the iron drying floor formed of a series of hollow triangular cast-iron grates (11-12-13). Beneath these are a number of fire-boxes (5), separated by bridge walls of fire brick extending below to the bottom of the furnace to form ash pits.

A flue or passage (10) connects with a secondary chamber for combustion of the gases (9), above which is a space (19) for receiving the heated air generated in the hollow grates of the drying floor and the air spaces at the sides of the lining. The chimney is connected with the secondary consuming chamber, which in the larger construction is supplied with a fuel grate.

Doors are provided for the fires and ash pits and for stoking the garbage on the drying floor. The grates may be rotated from the outside of the casing to assist in the stoking and drying process.

The operation of this crematory is somewhat complicated, depending upon the passage of the currents of air heated by passing through the hollow grates, and their introduction into the space (19) above the secondary combustion chamber, from which they are passed through the openings (20) to the upper consuming chamber. The special features are the hollow prismatic air-cooled grates, forming the drying floor, and below, the independent fire-boxes, for the partially dried garbage and for fuel to complete combustion. The only construction of this furnace is at Fort Barancas, Fla. No municipal plant has yet been built under this patent.

The Garbage Furnaces of Benj. Boulger

In April, 1895, Mr. B. Boulger, then of Chicago, secured a patent (No. 537,131) for improvements in garbage crematories, the purpose being to provide improved means for destroying "garbage so that the capacity of the furnace will be increased relatively to the amount of fuel consumed."

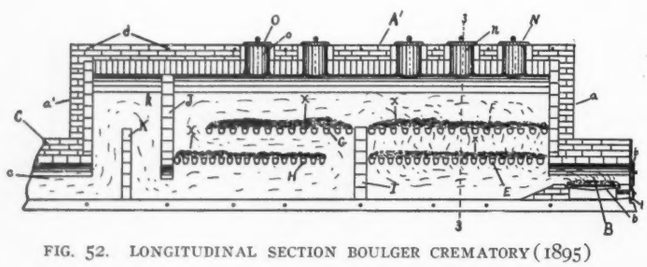


FIG. 52. LONGITUDINAL SECTION BOULGER CREMATORY (1895)

Externally this furnace (Fig. 52) was of the usual form of American crematories, but provided with an extra number of charging holes. It was divided by a vertical bridge wall into three compartments, one long upper chamber, with garbage grates continuous from end to end, and below this two smaller divisions with grates parallel to the upper tier, but with openings for the passage of the gases. At the chimney end the combustion chamber was divided by a vertical wall for the lower half of its height. The fire-box was at the front end, but placed outside the furnace.

The theory of this furnace was that the heat from the exterior fuel-box should pass up through the two sets of grates of the first compartment, then over the garbage on the grates of the second division, and beneath these to the combustion chamber and the chimney. A secondary fire-box was placed on the lower flue of the second division at some point before the combustion chamber.

But one installation of this form was made—at San Salvador, Central America—and this is not now in operation.

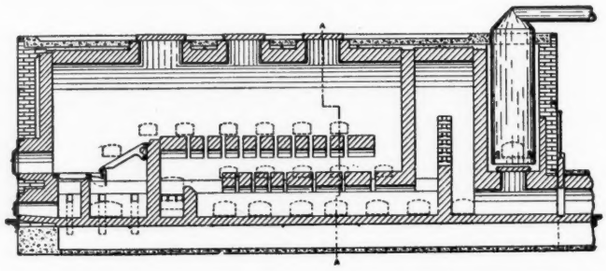


FIG. 53. LONGITUDINAL SECTION BOULGER CREMATORY (1906)

In November, 1906, Mr. Boulger took out a patent (No. 835,699) for new and useful improvements in garbage furnaces, the construction and operation of which are thus described by the patentee:

"In feeding this destructor the drier matter is dumped preferably into the charging hole nearest the main fire-box. The wet swill is received on two tiers of fire-brick arches laid in rings spaced several inches apart, the whole forming drying and burning hearths through which the waste and fire can readily make their way.

"The iron sloping grates in the fire-box may be given an oscillating downward movement. This slowly carries the waste and garbage thereon to the lower end, where the resulting ashes and clinker may be dumped. These sloping grates have an independent ash-pit, into which hot air is forced by steam jet blowers, situated under the back end of the furnace. The air passes along through the ducts under the furnace and absorbs some of the waste heat from the bottom of same before reaching the ash pits. Passing up through the grates and garbage of the main fire-box, this heated air assists in the drying and combustion process.

"The heat and flames from the primary fire and sloping grates pass the length of the furnace over the garbage deposited upon the first fire-brick hearth and return underneath them and over the second tier, igniting and destroying all the material thereon, and finally turning down under the second tier. At this point the secondary fire contributes its heat to the flaming gases, which pass into the combustion chamber and expand, and in their

incandescent state are drawn against and through the fire-brick checker work. The resulting carbondioxide is discharged into the chimney or carried up the by-pass to the boiler.

"All ashes are removed through the lower clean-out doors. The main fire doors can be placed on the side with the other door openings to economize floor space.

"When the destructor is started and attains the necessary temperature, little, if any, additional fuel is needed, as long as the garbage is supplied for consumption."

This form of furnace is employed in the smaller installations, for institutional and business purposes. For the larger sizes a small vertical steam boiler is connected with the combustion chamber and operated by the furnace heat. The power from this is employed for a forced draft, and for rotating the oscillating iron sloping grates. There is a small surplus of power available when the furnace is burning at its greatest capacity.

The Garbage Crematory of Messrs. Lewis & Kitchen and Fred P. Smith of Chicago

The inventions of Mr. F. P. Smith for the disposal of municipal waste are marked by versatility and bold designs. There are several forms of fire closets, incinerators and furnaces under his patents, some of which have been built by the United States Government and by private contractors. In 1904, as engineer for Messrs. Lewis & Kitchen, he designed and built at Fort Sam Houston, Texas, a new form of crematory, which was also installed at Fort Dupont, Del., 1906, and which is described in the *Engineering World,* Chicago, as follows:

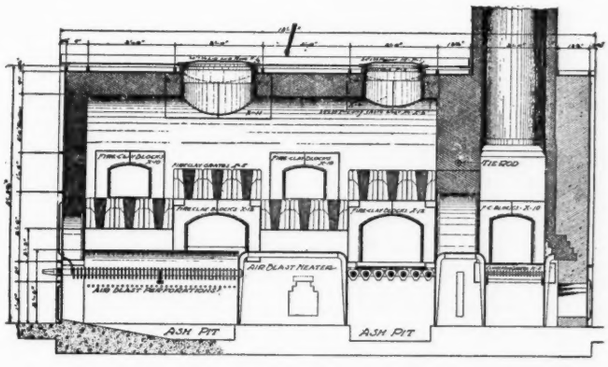


FIG. 54. LONGITUDINAL SECTION SMITH CREMATORY (1904) LEWIS & KITCHEN, CHICAGO, ILL.

"Garbage and refuse is dumped from sanitary carts upon a steel platform, whence it is thrown upon the garbage grates above the incinerating fires. When the garbage is dried and is partially burned upon the upper grates of clay, it is stoked to the lower grates for final combustion and to become the fuel for the drying of the succeeding charges of wet garbage. Fumes are destroyed and dust is arrested in the chamber at the base of the chimney. Air for combustion is heated before admission to the furnace by heavily flanged castings, which form the sides of the fire-boxes and the evaporating floors.

"The exterior is constructed of castiron sections with heavily reinforced flanges. The lining is of fire clay bricks with molded refractory clay blocks for the openings of doors and garbage hoppers. The garbage grates are of refractory clay."

This description does not clearly explain the construction or work of this furnace.

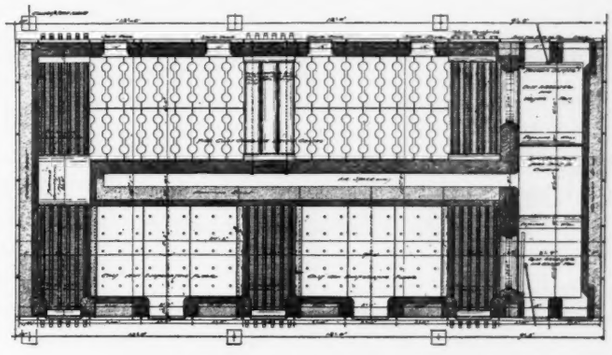


FIG. 55. PLAN F. P. SMITH CREMATORY

Fig. 55, of a crematory of larger capacity, shows more clearly the plan. The outer wall is of sectional castiron, flanged divisions, held by bolts and presumed to be rigid and strong enough to hold the thrust of the fire pressure. The interior lining is of sections of fire-clay tile, corresponding in size to the exterior casing, and having an air space next to this. The grates are heavy blocks of fire-clay, spaced to permit passage of garbage, and carried by projection of the interior lining. These bars are 10x10 inches in cross section and 6 feet in length, weighing upwards of 800 pounds each. The arrangement in two horizontal planes at different heights, with intervals between, is a novel departure from the usual methods.

The lower division of the furnace is a series of castiron evaporating platforms, alternating with transverse fuel-boxes, and so placed below the garbage grates to receive the partly dried waste, the liquid falling upon the evaporating surfaces.

The secondary fire is placed in the combustion chamber at the base of the stack. The exterior casing is pierced at intervals for air inlets, and the doors are arranged for stoking and firing in the usual way. The larger sizes have four charging ports, one being large enough for a large carcass.

The operation of this crematory is somewhat complicated. By reason of the longitudinal division wall the crematory is divided into two furnaces, alike in construction, and so arranged with connecting flues and dampers that the heat from fuel-boxes may be directed over either upper compartment and return above or below the adjoining compartment, passing finally through the common combustion chamber to the chimney. This action is assisted by the currents of heated air from the hollow fire-grates, and from a special heating device placed under the evaporating platforms.

In theory this crematory will receive large charges of garbage, refuse and animals upon the upper fire-clay grates, and when this is partially dried it is moved to the lower set of grates and finally destroyed, the heat being utilized for drying the succeeding charge.

There is but one example of the crematory for municipal work, which is at Steubenville, O., and this has just begun its active service.

The construction of the F. P. Smith crematories is carried on by the engineering firm of Lewis & Kitchen, Chicago, Ill.

The Standard Construction Co. and Mr. W. B. Wright of Chicago

In 1899 Mr. W. B. Wright erected under patent No. 575,088, 1897, an incinerator for the garbage and refuse of the group of institutions of Chicago at the "Bridewell." The report of this furnace was referred to in this journal for December, 1906.

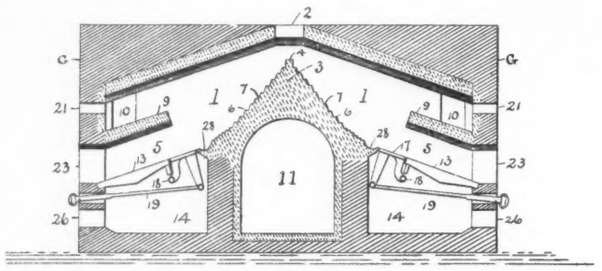


FIG. 56. CROSS-SECTION WRIGHT GARBAGE FURNACE (1899)

This invention (Fig. 56) is known as the Wright Garbage Incinerating Furnace, and follows in its general plans the cell type of the English destructors. It is practically two cells placed back to back, having a charging port (2) in common. The garbage falls upon a sharply inclined fire-brick hearth, having its surface serrated or notched to form shallow gutters or steps (7); the purpose being to separate the liquids, draining these off at the sides, and to break up the masses of packed garbage in their descent to the fire-box.

The grates of the fuel-box (13) are inclined from back to front and have over them an arch of fire-brick (9) deflecting the flames from the fuel-box downward to the garbage below, and also by the radiated heat above the arch assist in the combustion of the gases passing through the flue (10) downward between the walls of the furnaces and backward to the main central flue (11) leading to the chimney. There is provided a hinged iron platform or plate (17) between the fire-bars and the foot of the inclined drying hearth, for removal of ashes, and a similar arrangement at the front end of the grates, where coal is employed for fuel. This furnace may be fired by any oil or gas, through burners above the fuel box.

In another form of this furnace (Fig. 57) a secondary fire-box is placed above the primary fire, the heat and flames from which, reversing the order of the other construction, pass outward and below the reverberatory arch and enter the flue to the chimney (10) just above and at the sides of the primary fire.

There is also provided a forced draft of steam or air under the fire-bars, and a special set of dumping grates for the clinkers and ashes. The construction of this incinerator is always upon the double-cell principle. Though both cells are recorded as one furnace, each may be separately operated. In the experimental furnace erected for a trial of this system a steam boiler was placed in connection with the main flue, and about seventy-five horsepower was developed and maintained. This experimental furnace was not continued. The special features of this incinerator are the serrated surface of the drying hearth, which retains the liquids and decomposes the garbage; the high temperature and consequently complete destruction of the waste, and the cell form of construction, which permits of the use of a greater or lesser number of furnaces, according to the seasonal collection of waste.

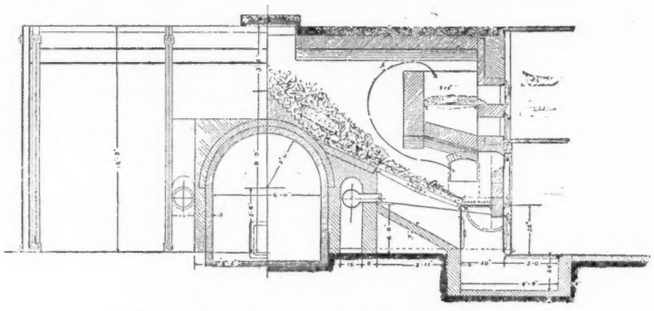


FIG. 57. WRIGHT GARBAGE FURNACE—FOR COAL

The only example of this incinerator now operating is at the "Bridewell," Chicago, in use since 1899, having a rated capacity of thirty tons per day.

The construction of the Wright garbage incinerating furnaces is in the control of the Standard Construction Company, Chicago, Ill.

The National Equipment Company and the Branch Incinerator

Mr. Jos. G. Branch, M.E., St. Louis, has brought out many valuable inventions in various lines of mechanical equipments and apparatus for industrial uses. He is also the patentee of the Branch garbage incinerator (patented November 21, 1905), a furnace for the disposal of garbage and refuse. This may be built in several sizes and combinations, but all follow the same type of construction.

The incinerator is of a single unit or furnace, in exterior dimensions and appearance similar to the general form of the American crematories. The furnaces are inclosed in a steel exterior casing strengthened by stays and tie rods in the usual manner. There are three charging ports on the top for garbage and one large circular opening for carcasses. The chimney is at the rear end, connected by flues with the furnaces, or placed beyond the battery of boilers if these are employed. There are two fire-boxes, one above the other, with the usual fire bars and ash pit.

The garbage charged through the ports in the top is received in a V-shaped basket formed of hollow water grates connected on the upper ends to headers, on the sides of the incinerating chamber, and tapped by threaded screw joints at the lower ends into a single large header placed in the middle line of the chamber. The headers and the water grates form a circulating water system, intended for heating feed water for the boilers when used.

Below this garbage grate is an iron evaporating pan to receive the liquids. At the sides of the incinerator are two chutes of steel which receive very wet portions of waste and are connected at their lower ends with the evaporating pan, forming a part of the lower hearth. Doors are provided for firing the two fuel boxes, stoking the garbage in the central chamber and for removing ashes.

The secondary fire for destroying gases is omitted. There is an offset or break in the rear of the furnace, by means of which the unconsumed gases from the upper and cooler compartment are brought down into the hotter and larger furnace compartment below, where they are mingled and consumed before being discharged into the chimney or under the boilers, when these are used.

Either natural or mechanical draft can be used, the latter being preferred. The incinerator can be built without a boiler for small installation, but for larger sizes a boiler of the horizontal pattern is installed. Where large quantities are to be destroyed, the incinerator is built in two units, the second one placed at right angles with the first, and so connected in their lower compartments that the heat and gases of both units are then passed into one or two boilers and serve as power generator for useful purposes.

The advantages claimed for this incinerator are: no odors or dust, no sorting or handling of waste, no auxiliary furnace or checkerwork needed, no firebrick for garbage grates, no uneven distribution of heat in the furnace, the fewest number of threaded joints of piping exposed to the fire, no water jackets or stay bolts, a complete and positive circulation through water grates and ease of access at all times. When the units are arranged in pairs the increased length of travel given to the heated gases insures better combustion and higher temperature under the boilers.

Since the invention of this incinerator only one experimental plant has been put into operation, and no municipal plants are yet built. There are as yet no records of experimental trials, and but little is known as to the powers of the incinerator in the actual municipal disposal work.

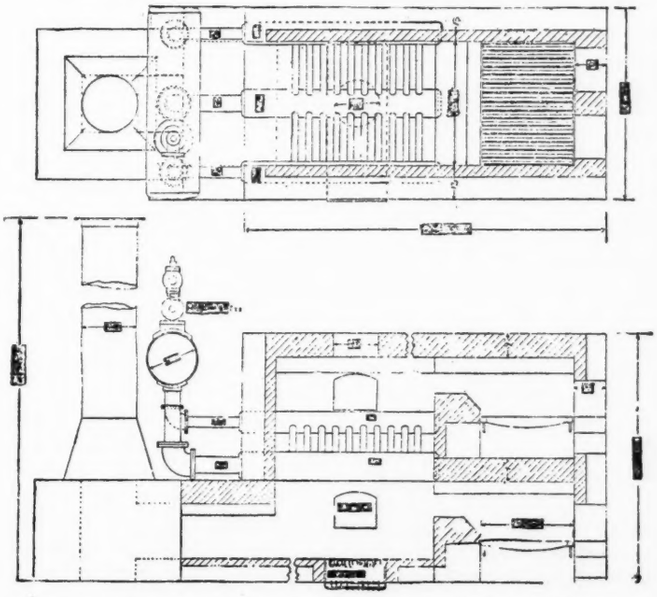


FIG. 58. PLAN AND LONGITUDINAL SECTION BRANCH GARBAGE INCINERATOR (1906)

London's Municipal Electric Plants

RETURNS from the electric plants in and around the County of London for the year ending March 31, 1906, have been published by the London County Council and are of considerable interest as indicating the net income or loss from these municipal undertakings. A statement covering all the period from the commencement of the municipalization of the various undertakings (this extending as far back as 1894 in the case of Hampstead, and as recently as 1905 at St. Marylebone) shows, according to these figures, a combined surplus, after payment of interest on loans, of £493,589, of which amount £293,230 had been used in redemption of loans. During the year municipal plants received for private lighting £380,873 and for power and heat £54,379, for rentals of meters and indicators £7,508, for public lighting, including maintenance of lamps, £96,566, and £1,822 miscellaneous revenue.

The expenditures for coal and other fuel were £93,996; other expenses for generation or purchase of current (all but one borough manufactured their own current) and distribution of current, £20,151; and the total cost of works was £182,896. In addition, the maintenance of public lamps cost £22,235; taxes amounted to £19,869; management cost £42,908, and other expenses brought the total up to £269,884, or 1.50d. per unit sold (3 cents per kw.h.).

Refuse destructors were worked in conjunction with destructor plants at six different boroughs. The amounts of refuse destroyed during the year varied from 11,611 tons at Woolwich to 45,388 at Stepney; the current generated by destructor steam varied from 350,292 units in the former plant to 1,901,399 at Hackney. The amount of the gross cost of working charged to the electricity account varied from £768 at Shoreditch to £3,158 at Stepney; and the balance charged to general tax account varied from £3,486 at Woolwich to £6,302 at Shoreditch. In amounts per unit of electricity generated the charges varied from 0.32d. at Hackney to 0.59d. at Woolwich. The charges against the boroughs for refuse destruction per ton destroyed varied from 1s. 10d. at Stepney to 6s. at Woolwich (45 cents to $1.50). The average charged to electricity, per unit generated, in all of the boroughs, was 0.43d.; and the average charged to the tax account per ton of garbage destroyed was 3s. 2½d. (80 cents). The method of adjusting these accounts differed in the various boroughs. Four, 4.5 and 5.2 pounds of coal were charged to electricity account per unit generated by destructor steam in three of the boroughs. In two others a charge of ½d. per unit destroyed by destructor steam was made against the electricity account and in another this charge was 0.59d.

NEWS OF THE MUNICIPALITIES

Divers Subjects of General Interest and Their Treatment by City Councils and Officials—Streets, Water Works, Lighting and Sanitary Matters—Police and Fire Items—Government and Finance

Roads and Pavements

Atlantic City, N. J.—Two plants for turning out paving material for one street will be operated in paving Atlantic avenue with bitulithic. The first plant is at Kentucky and Mediterranean avenues, and the new one will be in Chelsea, at the southern end of the town. The Standard Bitulithic Company will be in a position to double its speed and work from both ends of the street at once.

Buffalo, N. Y.—In advocating a municipal asphalt paving plant, Alderman Joseph Butler stated that the cost of repairing asphalt pavements during the past six years has been, in round numbers, as follows: In 1901, $80,000; 1902, $76,000; 1903, $68,000; 1904, $83,000; 1905, $106,000; 1906, $213,000.

Indianapolis, Ind.—In the opinion of Mayor Bookwalter and City Engineer Blaine H. Miller, the best asphalt streets laid in Indianapolis nine years ago were put down by the Western Paving and Supply Company. This is the opinion reached after an examination of all the asphalt streets of the city on which the contractors' guarantees expire this year. "The conditions as we found them," said the Mayor, "are that there is not a street that was laid by the Warren-Scharf Company that is in perfect condition. Most of their streets are cracked across. The streets laid by the Indiana Bermudez Company are practically all bad. The streets laid by the Western Paving and Supply Company are all good." On the same tour of inspection, the Mayor says, he found that all the brick streets and alleys on which the guarantees expire this year are in good condition except one, barring the damage done by heating companies.

Jacksonville, Fla.—The County Commissioners have authorized L. D. De Camp, of Los Angeles, Cal., and his associates to construct one mile of trial road of oil and sand mixture twenty feet wide, and at such place as is designated. The trial road is to cost not more than $4,500, the Board of County Commissioners is to have the grading and engineering part of the work done, and the understanding is that the experimental road will be paid for if it is satisfactory. Mr. De Camp states that the sand found in the locality is excellent for the purpose, and the road built should be equal or superior to those of California.

Concord, N. H.—A long step toward the establishment of a broad boulevard, extending from Boston to the White mountains, will be taken during the present year, in the construction of the so-called "Merrimack Valley trunk line," a highway authorized by the last session of the Legislature. This line, which will be a wide macadamized road extending from the Massachusetts State line at the southerly end of the city of Nashua, to the northerly end of Laconia, on Lake Winnipesaukee, will be constructed jointly by the State and by the towns and cities through which it will pass. At its southern extremity it will connect with the Massachusetts State highway in Tyngsboro. The entire length of the trunk line will be approximately 70 miles. It will pass through the cities of Nashua, Manchester, Concord, Franklin and Laconia, and the towns of Merrimack, Bedford, Hooksett, Pembroke, Boscawen, Tilton and Belmont. The boulevard, as its name indicates, will be laid out for the greater part of the route along the banks of the Merrimack river.

Philadelphia, Pa.—A plan has been prepared by the Bureau of Surveys for a reduction in the grade of Arch street, which leads up from Delaware avenue, the principal street along the water front. The present grade of Arch street is twenty feet to the hundred at the steepest section, and it is proposed to change this to a gradual incline of five feet to the hundred throughout. In order to do this, Front street will have to be swung to the west, so as to strike Arch street at a point considerably above its present intersection. This plan, though likely to cost $200,000, is much more economical than the other alternative, that of cutting down Front street to meet the new grade of Arch street, which would require the securing of a large number of properties along the street in order to make the change, or the payment of heavy damages to property owners.

Sewerage and Sanitation

Albany, N. Y.—Dr. E. H. Porter, State Commissioner of Health, has adopted a new policy in relation to sewerage, which is of much importance to municipalities throughout the State. Some time ago the city of Fulton asked permission to use a new system of sewers on the Oswego river. The sewers were built at a large expense, but the city was prevented from discharging any additional sewage into the river without the permission of the State Health Department. Dr. Porter caused a careful investigation of the Oswego watershed to be made. This has been completed by Prof. H. N. Ogden, of Cornell University, and his report, with maps and plans, is now on file in the Health Commissioner's office. It shows that the streams tributary to the Oswego drain hundreds of miles of territory populated by hundreds of thousands. On this watershed are Syracuse, Auburn, Fulton and Oswego and many smaller localities. These municipalities have been notified, that hereafter no more sewage shall be discharged into the river, and all sewage must be treated in sewage disposal plants.

New York, N. Y.—In a letter to the Rapid Transit Commissioners Dr. George A. Soper gives the results of an investigation of the sanitary condition of the Rapid Transit Subway. In his opinion subway dust has had no appreciable effect on the health of men. The frequent occurrence of dry pleurisy among employees is attributed to the result of attacks of acute pleurisy experienced by men before entering on their subway employment. It is recommended: that care be taken to see that subway employees be selected from persons free from respiratory disease; that physical examination of employees be made at intervals; that dust be prevented, so far as possible, by sweeping and cleaning stations and stairways in a more strictly sanitary manner, and that the city ordinance against spitting be strictly enforced.

Philadelphia, Pa.—The Meat Inspection Bill recently signed by Governor Stuart will give Philadelphia better protection against diseased or tainted meat than any other great city in the country, according to Dr. A. C. Abbott, Chief of the Bureau of Health. The act gives the Live Stock Sanitary Board, which is a part of the State Department of Agriculture, power to prevent meat from diseased cattle being shipped to or from any point in the State. This supplements the Federal laws regarding the shipment of bad meat from another State.

Water Works

BAYONNE, N. J.—The New York and New Jersey Water Company has sent a bill for $4,680 to the city in compromise of a claim for $5,990 for water furnished the city during the year 1906, as shown by their Venturi meters, in excess of the measurement of the city's meters. The compromise was based on the result of joint tests. It was agreed that hereafter there shall be a comparison at least once each month, and oftener if required by the city, between the readings of the company's Venturi meters and the city's meters, in order that these differences may be detected and remedied promptly; and that hereafter if any difference between the two sets of meters arises, not exceeding 1½ per cent. of the amount of water shown by the company's meters to have been delivered to the city in any quarter, that the same be adjusted by allowance of one-half thereof by the company to the city upon payment of the bill for said quarter; and if a difference exceeds 1½ per cent. that a joint test be promptly made of the meters of both the company and the city, and settlement of difference be made on the basis of the results shown by such joint test.

ELIZABETH, N. J.—The Board of Freeholders has granted the request of the Consumers' Aqueduct Company for permission to make important changes in the line, grade and character of Madison Hill road, the Raritan road and two bridges near Rahway, thereby opening the way for the complete development of a scheme for controlling one of the largest water supply sections in the State. A dam will be built near Rahway forming a reservoir three miles long, 400 to 800 feet wide and from 4 to 30 feet deep. The object is to supply towns and factories along Staten Island Sound. The work is to be completed August 1, 1909.

NORTH CHELMSFORD, MASS.—One year after their first annual meeting, June 3, the Water Commissioners presented to the residents of the district a completed water system. The new system is installed without any increase in taxes, the money having been secured by bonds which can be paid out of earnings. The supply is from ten wells near Crystal Lake. A standpipe 22 by 120 feet has been built which will deliver water at a pressure of 75 pounds. The works will begin with 166 consumers. The total cost of plant was $68,000. The Commissioners are Messrs. James P. Dunnigan, George C. Moore and Dr. F. E. Varney.

RACINE, WIS.—In order to further the plans for municipal ownership of waterworks, a committee composed of the Mayor, City Attorney, City Engineer, three Aldermen and three citizens has been appointed to investigate and report. The first step to be taken by the committee will be to engage an engineer to place a value on the plant and with this as an estimate of the amount of bonds to be floated will go into money markets and ascertain under what conditions the deal can be financed. Present estimates of the value of the plant vary from $400,000 to $1,000,000.

Street Lighting and Electric Power

DAVENPORT, IOWA.—A campaign for the inspection of gas meters is being conducted. An informal ballot is being taken to ascertain public sentiment on the adoption of the system used in Cleveland, O., which is described as follows by Chief Engineer William J. Carter: "The city chemist tests the quality of the gas furnished and makes regular reports. This officer also tests meters upon application of the owner. The owner is required to deposit a fee of one dollar. If the meter is running fast this money is refunded. If it is running slow, half of the fee is paid to the gas company for installing a temporary meter while the test is being made, and the other half goes to the Lighting Department."

PATERSON, N. J.—A seven-year contract between this city and the Public Service Corporation, whereby the latter agree to furnish arc lamps for street lighting for $77.50 per year each, and to light all public buildings at a flat rate of eight cents per kilowatt hour, has been approved by the Board of Works and City Counsel instructed to draw up a contract to that effect to become active from July 1 next. The contract will also contain a provision that after January 1, 1908, the Public Service Corporation shall charge but ten cents per kilowatt hour for current furnished for incandescent lighting.

SCRANTON, PA.—After a conference with other city officials Mayor Dimmick has requested the City Solicitor to prepare an ordinance, similar to the Pittsburg ordinance, requiring the placing of electric wires underground, and send copies of the proposed ordinance to representatives of the several companies concerned. Later a meeting will be held with representatives of the electrical companies in order to give them an opportunity to make any suggestions that might tend to relieve them of unnecessary hardships.

SUPERIOR, WIS.—Plans and estimates for the light plant have been received from Engineer Ford, of St. Louis. The opinion is given that the city should not rely wholly on power to be supplied by the Great Northern Company. According to the estimates power can be produced for less cost by gas engines than the rate made by the gas company. The cost of a plant for public lighting only is placed at $66,800. The cost of a public and commercial lighting plant with a 400-horsepower gas engine is estimated at $69,600 additional. The estimated annual operating expenses for public lighting with power from the Great Northern Company is given as $19,590, or $59.97 per arc light. An additional annual expense of $14,400 with the gas plant would furnish the city lighting and commercial lighting that would bring a revenue of $27,375.

Fire and Police

BESSEMER, ALA.—Mayor J. J. Sullivan states that he will offer his service for a period of three months as Chief of Police to the next administration. Moreover, he will deposit five hundred dollars for the privilege and indemnify the city from litigation that may occur in consequence of his acts. The Mayor says he would like to show people how the laws can be enforced.

NEW YORK CITY.—The Assembly has passed Senator Agnew's bill providing for night police courts in New York City, and two additional magistrates in Manhattan who shall hold the night court; four additional magistrates in Brooklyn and two in Queens are also provided for.

SYRACUSE, N. Y.—A new system for receiving telephone alarms of fire has been established by Chief Engineer John P. Quigley of the Fire Department. In the exchanges of the two telephone companies there has been placed a call box by which the operator, upon receiving an alarm of fire from a subscriber over the telephone, can sound two blows on all the gongs and bells of the fire alarm system. The house watchman in each station upon hearing the two blows struck takes off the receivers of both 'phones and discovers over which 'phone the alarm is being sent; he then hangs up the receiver of the 'phone not in use and places his hand over the transmitter of the 'phone over which the alarm is being sent. The latter action is for the purpose of preventing the noise of confusion on the floor from entering the telephone system. He listens to what the operator says without asking any questions whatsoever. When the operator has repeated

the call a sufficient number of times she then says: "Have you all got it?" Any house watchman who has not received the call asks her to repeat it. Under the old system the horses were not released from their stalls until after the telephone alarm had been received. Under the new system the horses are released as soon as the operator in the telephone offices sounds the blows by use of the call boxes in the exchanges.

Government and Finance

Atlantic, Ia.—In accordance with provisions of the new State law, the City Council of Atlantic has made appropriations for the running expenses of the city for the entire year. The amount appropriated by them was $54,500, an increase of $12,000 over last year, when the city spent but $42,000. The appropriations for this year were divided as follows: Electric-light plant for running expenses, $15,000; for repairs, $9,500; waterworks for running expenses, $14,500; for repairs, $7,000; sewers $500, refunding bonds $2500, salaries $4,055, printing $300, for revising ordinances $400, public buildings and grounds $225, fire department $650, streets and alleys $1,800. The contemplated repairs at the waterworks plant include the putting down of more wells to accommodate the increase in water consumption, incident upon new sewers.

Bayonne, N. J.—The Board of Councilmen has passed a resolution directing the City Attorney to compile and index the city ordinances and have them printed.

Minneapolis, Minn.—By an almost unanimous vote of the City Council it has been decided to submit the proposed charter, which has been up for consideration at three previous general elections, to the people at a special election to be held September 17 next. Friends of the charter claim that voters have been too busy to pay attention to the matter at general elections. Now a systematic campaign of education will be carried on. A fund of $7,000 has been raised to pay the cost of the election.

Pittsburg, Pa.—News of the signing of the Smith Civil Service bill by the Governor was received with great satisfaction. Friends of the new law assert that under the new law it will be impossible to use public appointments as a political reward. Positions as high as those of bureau superintendencies will be filled by promotion of efficient public officers. One of the first works of the Commission will be to classify the service so that all appointments where possible may be made by promotion.

Refuse Collection and Disposal

Alamogordo, N. M.—It is quite probable that arrangements will be made by the Commissioners of Otero county at their meeting on the first Monday in July to have the street sprinkling done under the provisions of the new law. This law assesses the cost of sprinkling in unincorporated towns the size of Alamogordo against the property owners along the streets so sprinkled.

Berlin, Germany.—A motor wagon with some novel features has just been supplied to the Berlin Municipal Council. The chief advantage of this motor watering wagon, compared with the horse-driven variety, is that its mechanical power makes it possible to spray water over a surface up to 65 feet in width, whereas the variable hydrostatic pressure in an ordinary tank only allows of a spray covering from 12 to 20 feet at best.

Grand Rapids, Mich.—The Committee on Ordinances is of the opinion that an ordinance relative to the separation of garbage is unnecessary at present, since the matter is fully covered by rules of the Common Council and by the Board of Health. These rules forbid the placing in garbage cans of cigar stubs, ashes and other substances uncongenial to porcine garbage reducers and provides fully for violations of the rules.

Parks and City Beauty

Clarksville, Tex.—The Board of Trade has inaugurated a movement looking to the removal of all billboards, swinging signs and other undesirable advertising schemes from the Public Square and from the various streets leading to the square for a distance of one block each way. The movement was inaugurated by the passage of an ordinance by the City Council demanding the construction of concrete sidewalks along all streets within the fire limits not already provided with concrete walks. Outside stairways and other obstructions have also been ordered removed by the city.

Dayton, O.—Two committees of the Riverdale Welfare Club have been appointed by President F. Gillum Cromer, one to labor with the city official, the other with citizens generally, in favor of the adoption of Architect Wm. E. Russ' plan for the Great Miami Boulevard and the park which it is proposed to locate at the lower end of it. The park is to cover an area of 11 1-2 acres, options on which have been secured for $45,800. It is the most central and accessible of all plots of ground now available. The plans contemplate a six-acre playground, a tennis court and a bath house.

Jacksonville, Fla.—In order to place double tracks for the street cars on Main street the following plan has been adopted: Each of the double row of palms between which the track runs will be moved eighteen inches into the roadway which runs on each side of the parkway. In order to preserve the width of the roadways at 20 feet, the curbs will be set in toward the property line. It is believed that the trees which now form an arch over the tracks, making the most attractive street in the city, can be safely moved. If any should be killed, however, the railway will replace them.

Kalamazoo, Mich.—Kalamazoo now bears the distinction of being the only city of its size in the country which has a tent colony for the treatment of tuberculosis cases. At the present time the colony consists of four tents measuring from 12x12 to 14x14 feet. Two patients are ready to go to the colony and a nurse secured.

Newark, N. J.—The entire City Council of Passaic, together with a delegation from the Board of Trade of that city, visited Newark in six automobiles and were shown through the principal parks in the county park system by Secretary Alonzo Church of the Essex Park Commission. The visitors are busy inaugurating a movement for a Passaic county park system, to run all the way from Paterson to the Passaic and Essex county line, along the mountain ridge. They would have a series of parks connected by a boulevard or parkway, such as now connects South Mountain and Eagle Rock. Their entire scheme embraces a park and parkway system sustained by two counties, and their plan would call for an extension of Essex's parkway from Eagle Rock to the county line, where it would join with the Passaic county parkway.

Richmond, Va.—The annual spring flower distribution to the school children of Richmond was recently finished by the Civic Improvement League. More than nine thousand children received a packet of seeds, together with a printed card of instructions for the planting and care of flowers. Every child receiving a package of the league flower seeds pledges as follows:

I. I promise to plant these seeds myself, and take care of their product.
II. I promise to help keep my back yard clean.
III. I promise not to throw any paper or trash in the streets of our city.
IV. I promise (for boys) not to spit on the sidewalk.
V. I promise to do all in my power to make my city more beautiful and attractive.

ST. LOUIS, MO.—According to the census of City Forester Meyer, there are 53,370 trees growing along the streets of the city, enough to make a forest growth of 100 acres. Less than 7,000 trees were found to be in poor condition. In order to provide the parks and streets with trees Mr. Meyer thinks the city should maintain a nursery of fifty acres. The tree most suited to the climate and conditions of St. Louis is the sycamore tree, its superiority on downtown streets being especially notable. It is hoped that St. Louis will be as famous some day for its sycamores as Berlin is for its lindens.

SPRINGFIELD, MASS.—A Springfield Riverfront Improvement bill, which meets the approval of representatives of the city, the railroad companies and the State Committee on Railroads, has been prepared. The bill provides that, on petition of the Mayor and Aldermen, the Railroad Commission may work out details of the bill. The details referred to are principally a line for the New Haven Railroad at the west bank of the river and connecting all its branches in the city. Arrangements are to be made for the Park Commissioners to take over the railroad property along the river, and navigation interests will be protected. Special permission is given to issue fifty-year bonds to pay for the improvement.

Rapid Transit

CHICAGO, ILL.—Lack of strong and suitable bridges connecting the west with the north and south sides appears certain to delay seriously the through street car routes which the Board of Supervising Traction Engineers is planning to establish between those sections of the city. The present bridges are generally too weak or too narrow to permit the use of the big new cars which the companies intend to put into service and which alone, the engineers believe, should be placed upon through routes running from the populous west side to the north and south divisions.

PITTSBURG, PA.—A forty-five-foot stage of water in the Monongahela and Allegheny rivers will not affect the system of the Pittsburg Subway's Company, according to E. K. Morse, Chief Engineer of the company. Mr. Morse said that the recent thirty-six-foot stage of the water in the city had been observed with interest by the promoters of the subway, and that they had come to the conclusion that their plan was to construct those downtown stations which are within reach of floods on the principle of the hatches of a ship, so that they could be closed down absolutely during floods. No attention need then be paid to floods, except to clean off the mud and open the stations after the water had gone down. It will not be necessary, in the opinion of the engineer, to encase the subway in metal throughout in order to make it water tight. Mr. Morse made the prediction that the fastest time known anywhere in the world on a street railway line will be made on the Pittsburg subway system.

GRAND RAPIDS, MICH.—The misunderstandings between the City Government and the Grand Rapids Railway seem in a fair way towards settlement. General Manager Hanchett agrees to build the two needed extensions if some changes are made in the city charter. The principal one of the changes desired is the striking out of the clause providing that his company must give up the use of its tracks to any interurban or other company desiring entrance into the city. Mr. Hanchett also desires that the restriction of franchises to a period of twenty years should also be omitted.

SOUTH BEND, IND.—Members of the City Council who have returned from a tour of 450 miles of leading interurban lines in Indiana came back convinced that the centralization of all interurbans at a common point convenient to the business district and the entrance of interurban cars over local lines is a wise policy. The principal cities visited were Fort Wayne, Logansport, Indianapolis and Muncie.

TORONTO, ONT.—Judgments have been given by the Ontario Railway and Municipal Board on cases brought by the City of Toronto against the Toronto Railway Company. The Board states that the population of the city will probably increase during the next ten years at the rate of 15,000 a year and finds that the company has been putting on more cars in the attempt to relieve the overcrowding, but cannot agree with the city's contention that more cars operating on existing lines would solve the problem, as this would endanger the pedestrian and vehicle traffic. Consequently the company is ordered to build with reasonable dispatch between ten and fifteen miles of additional double track and 100 new cars, the cars to be furnished in time to be distributed and put in operation on the system as soon as the new lines are built. The matter of routes is left to the company and the city.

Miscellaneous

DETROIT, MICH.—An ordinance has been proposed by Alderman Rosenthal whose object is to reserve Detroit public markets to farmers. To do this it prohibits any person not a farmer or gardener from selling any articles of produce on the public market grounds. Every person desiring to sell in the public market must file an affidavit with the Market Clerk showing that he is a farmer selling his own produce. Sales will not be permitted through any agent other than a member of his immediate family, and the produce must be brought to market on his own wagon. Persons other than producers may sell produce in certain designated places.

HARTFORD, CONN.—Before the Board of Finance, City Engineer Ford and Commissioners Angus and Clifford, of the Street Board, appeared to support the ordinance providing for an increase in the salary of the City Engineer and of his assistants. Both of the Commissioners stated that it is hard to get competent engineers who will remain with the Department because the competition is keen and those now employed are offered higher salaries to go elsewhere. City Engineer Ford showed letters that had been written to a number of his assistants offering them more pay than they now receive. He said the Panama Canal, the subway work in New York and in general the engineering activity all over the country makes an unusually heavy demand for engineers.

SUPERIOR, WIS.—Harbor frontage matters are attracting attention in Superior and there is a desire to take a lesson from Lower Lake cities in such matters. Buffalo, for instance, is just now spending $800,000 on the improvement of the Buffalo river for the purpose of affording dock frontage for various enterprises that need such location, but are crowded out by the large interests that have absorbed practically the entire harbor front. The Superior idea is to retain all street ends or barter them for an equal continuous frontage at a location of strategic value.

WEST HAZELTON, PA.—The West Hazelton Borough Council recently instructed the Law and Ordinance Committee to draft a curfew ordinance requiring children under sixteen years of age to be home by 9 o'clock, at night, and men by 10 o'clock. Mahlon Endy, the Councilman who suggested these features, said every husband should not remain out at night later than 10 o'clock unless accompanied by his family. He said that lodge meetings did not last longer than that hour, and if any sessions were prolonged beyond that period members should be compelled to suffer the consequences of the law.

REVIEW OF THE PERIODICALS

Abstracts and Synopses of Important Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading United States Periodicals

Keeping Account of Road Maintenance

IN *Good Roads Magazine* for May is an article by Mr. Frank J. Eppele, County Engineer of Mercer County, N. J., entitled, "A System of Keeping Account of Road Maintenance," in which he describes the method employed for Mercer County for keeping such accounts. The article is accompanied by a series of blanks which are used in collecting and recording the data, which include a form for the maintenance account for one month, another for one year, and a third summarizing the accounts for the year. There is also a form for preparing a directory of the roads; and others for making daily reports and weekly of the work done on each road and also for a monthly report to be made by the supervisor of road work. He explains that his object was a plan "that would not only create but encourage an honorable rivalry or competition, first between the various townships in a county, and then between the counties themselves." He therefore devised "a system of bookkeeping which shows in detail not only the cost of all material and labor, but also the amount of work performed by all men or groups of men employed."

Composition of Portland Cement

UNDER the title of "Ultimate Composition of Portland Cement," Mr. Richard K. Mead, editor of the *Chemical Engineer*, discusses in the May number of that monthly the nature of the combination with each other of the essential elements of this cement and the actual percentage of the various materials found in American Portland cements. The result of his study of this subject he states as follows:

In conclusion it may be said that the following represents about the limits of chemical composition met with in *freshly made* American Portland cements which pass the standard specifications for soundness, setting time and tensile strength:

Silica	20—24 per cent.
Alumina	5— 9
Iron Oxide	2— 4
Lime	60—63.5
Sulphur Trioxide	1— 2
Sulphur Trioxide	1.5

The average is represented by the following:

Silica	22 per cent.
Alumina	7.5
Iron Oxide	2.5
Lime	62.0
Magnesia	2.5
Sulphur Trioxide	1.5

The Lehigh Valley cements (made from argillaceous limestone) are characterized by high magnesia, usually between 3 and 3.5 per cent., though occasionally as low as 2.5 per cent. and as high as 4 per cent. They contain about 2.5 per cent. iron oxide and about twice as much silica as iron oxide and alumina combined. In those cements from the western end of the deposit this ratio is somewhat higher, however.

Most of the marl cements are low in magnesia, some of them containing as little as 0.5 per cent. Some of the Michigan marl cements are high in iron oxide, 3 to 4 per cent. This comes from the clay, or shale, however, and hence is also characteristic of some cements made from limestone and clay or shale.

The Alabama cements made from the Selma chalk at Demopolis are high in iron and alumina, published analyses showing 12 to 14 per cent. iron oxide and alumina and only about 20 per cent. silica.

Police Reform

The Outlook of May 4, in editorial discussion of its contributed article on the organizations and temptations of "The New York Police," presents those "Radical Remedies" which, it believes, would overcome the graft system. The first is a reversal of the conditions under which the police commissioner—the head of the force—now has a temporary tenure of office, while his subordinates have a permanent tenure. There is as good reason, say *The Outlook* editors, for making the commissioner's office "non-political and measurably permanent" as for so safe-guarding "the office of judge." On the other hand, "the policeman is a private soldier" and the force "should be organized on military principles." The civil courts should have nothing to do with the policeman's dismissal from office or retention in it. That should rest with a court martial. The second "radical remedy" is based on the experience that "in a democratic community it is very difficult to enforce a law which directly affects the entire community, if the public opinion of the community is opposed to its enforcement." This would extend to cities the local option law now confined to rural communities and would extend over Sunday the local option principle now applied only to weekdays. The local laws could then be enforced, and there would be eliminated those temptations to corruption that now abound. Finally, "in every city the detective bureau should be under the autocratic authority of the commissioner," secret societies within the force should be broken up, and there should be secured police magistrates who would deem it their duty to protect society. But these minor reforms would quickly follow, *The Outlook* believes, the two radical remedies first proposed.

Regulating Public Utilities

UNDER the confident caption, "Municipal Ownership Problem Solved," Allen Ripley Foote points out, in *Moody's Magazine,* an interesting middle course of regulation. The article's publication in a strictly financial periodical seems to give it a special significance. He believes that a safe and just outcome lies only in "a clearly-defined and effectively safe-guarded system of State regulation, based upon a correct system of public accounting, auditing, and reporting, enforced by authority of the State." This plan permits private ownership and operation; and it makes the adoption of a correct, and uniform, system of public accounting, auditing and reporting a first essential step. The author names as "principles of correct regulation": "1. That the special privilege to render a public utility service in any community shall be an exclusive, perpetual, and an untaxed grant; 2. that all services rendered under authority of such a grant shall be supplied to users at actual cost, plus a reasonable profit." Arguing, then, that "municipal waste exceeds corporate profit," he claims that if, under State regulation and with a knowledge of all qualifying facts, the prices charged to users for service rendered be placed on a basis that will yield an income only sufficient to pay all costs of ownership and operation, "plus a fair dividend on capital invested," the price will be as low as any honest man can require. There will be no reason for demanding on the one hand municipal ownership nor on the other for protesting against State regulation. The attitude of the people to the investors under this system is pictured thus: "This is our business. For its purposes we will employ your capital under our own management. We will insure your investment against impairment; we will pay you a reasonable profit for its use." The arrangement would be a good one, the author points out, for both investors and public; and the reason that such State regulation has not yet been enacted is, he believes, the opposition of speculators: political on the side of municipal ownership and financial on the side of private ownership. The argument, so briefly outlined here, is presented by him at some length and with interesting reasoning.

Obstacles to Civic Art

THE article on civic improvements, with "the case of New York" as his text, which Herbert Croly contributes to *The Architectural Record* for May, is an exceedingly interesting discussion. It is based on the unusual assumption that, for all the good printers' ink expended on the subject, civic improvement is not making anything like the practical headway that it should to bear a proper proportion to the writing about it. The cases of Baltimore and San Francisco, where fire vainly furnished the opportunity for model rebuilding, are cited, and then the ineffectiveness in tangible results of the recent report of the City Improvement Commission of New York is described as a final and convincing proof that the assumption is well made. This is not the place to argue the matter; but there is little doubt that "the sincere friends of the improvement of our American cities in convenience and appearance," to whom Mr. Croly addresses himself, would not accept these three cases as "proving" anything; and that they would like nothing better than the chance to quote statistics of actual civic improvement to show that it does keep pace with the matter printed about it. But leaving aside the question of the accuracy of Mr. Croly's assumption, there remains a suggestive discussion of the financial phase of the problem of civic improvement —a phase that bothers city officials everywhere, for the improvement in mind is not the routine but the now popular grandiose: the opening of new thoroughfares through closely built-up sections, the widening of streets, the grouping of public buildings, the spectacularly effective, from the æsthetic standpoint. He shows that for the city of New York to undertake such improvements two constitutional amendments would, at the very outset, be necessary. One of these would exclude money spent upon such street improvements from that debt on which the constitution places a limit; the other would permit the municipality to condemn not merely the land actually necessary for a new street, but the immediately adjoining property as well, in order that by the resale of the latter, after the improvements were effected, the city might recoup the cost of its work. The ultimate effect of the two amendments would be, he says, an enormous increase in the powers of the municipal administration. "The Mayor and the Board of Estimate would have the authority and the means to emabrk on what would be a gigantic real estate speculation; and . . . public opinion would want to be very much more convinced than it is that the municipal officials are incorruptible and competent before it could accept such radical changes in the legal constitution of the city. . . . Thus the municipal art reform movement is closely associated with the general movement towards municipal reform." The cities that wish to embark on civic improvement on a large scale must consequently obtain, Mr. Croly thinks, "municipal governments like that of Galveston, which is endowed with complete responsibility and large powers, and which is competent to exercise these powers in the general public interest." This public interest is, he believes, in "almost all such improvements" insistently opposed by a special interest: "that of the owners of real estate." They "have been perhaps the gravest obstacle to the making of the greater and better American city," one more serious than has been offered by "the selfish and corrupt purposes of local franchise corporations." This is because the real estate speculators believe that their interests demand that "congestion and concentration of business and population which enormously increases real estate values along particular lines and at particular points." Municipal art reform in any large sense must therefore wait, Mr. Croly is sure, not only for constitutional amendments, but until the individual owner of real estate can be shorn of his present public mastery.

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Periodicals Listed Below

Acetylene Journal, Chicago.
Ainsley's Magazine, New York.
American Academy of Political and Social Science, Annals, Philadelphia.
American Architect, New York.
American Banker, New York.
American Gas Light Journal, New York.
American Homes and Gardens, New York.
American Institute of Architects, Bulletin, New York.
American Institute of Electrical Engineers, New York.
American Magazine, New York.
American Society of Civil Engineers, Proceedings, New York.
Appleton's Magazine, New York.
Architects' and Builders' Journal, Baltimore.
Architects' and Builders' Magazine, New York.
Architectural Record, New York.
Architectural Review, Boston.
Arena, Trenton.
Associated Engineering Societies, Journal, Boston.
Atlantic Monthly, Boston.
Brick, Chicago.
Broadway Magazine, New York.
Canadian Municipal Journal, Montreal.
Cement, New York.
Cement Age, New York.
Century, New York.
Charities, New York.
Clay Record, Chicago.
Clay Worker, Indianapolis.
Collier's Weekly, New York.
Construction News, New York.
Consular-Reports, Washington.
Contract Journal, London.
Cosmopolitan, New York.
Country Life in America, New York.
Craftsman, New York.
Department of Labor, Bulletin, Washington.
Eclectic Magazine, New York.
Electrical Railway Review, Chicago.
Electrical Review, New York.
Electrical World, New York.
Engineer, Chicago.
Engineer, London.
Engineering-Contracting, New York.
Engineering and Mining Journal, New York.
Engineering Magazine, New York.
Engineering News, New York.
Engineering Record, New York.
Engineering Review, New York.
Engineering Soc'y of West. Penn., Pittsburg.
Engineering World, Chicago.
Engineers' Club, Proceedings, Philadelphia.
Everybody's Magazine, New York.
Far Eastern Review, Manila.
Financier, New York.
Fire and Water, New York.
Fireman's Herald, New York.
Forum, New York.
Franklin Institute Journal, Philadelphia.
Gardening, Chicago.
Gesundheits Ingenieur, Munich.
Good Roads, New York.
Harper's Monthly, New York.
Harper's Weekly, New York.
House and Garden, Philadelphia.
House Beautiful, Chicago.
Illuminating Engineer, New York.
Independent, New York.
Indian and Eastern Engineer, Calcutta.
Insurance Engineering, New York.
Iron Age, New York.
Leslie's Weekly, New York.
Literary Digest, New York.
Local Government Journal, London.
McClure's Magazine, New York.
Manufacturers' Record, Baltimore.
Metropolitan Magazine, New York.
Moody Magazine, New York.
Municipal Engineering, Indianapolis.
Municipal Journal and Engineer, New York.
Municipal Journal, London.
Municipal World, St. Thomas, Ont.
Munsey's Magazine, New York.
New England Water Works Ass'n Journal, Boston.
North American Review, New York.
Outlook, New York.
Pacific Monthly, Portland, Ore.
Pacific Municipalities, Santa Clara, Cal.
Park and Cemetery, Chicago.
Pearson's Magazine, New York.
People's Magazine New York.
Popular Science Monthly, New York.
Power, New York.
Preventive Medicine Journal, London.
Progressive Age, New York.
Public Health, London.
Public Service, Chicago.
Putnam's Magazine, New York.
Review of Reviews, New York.
Revista Municipal, Havana.
Rock Products, Louisville.
Sanitary Institute Journal, London.
Scientific American, New York.
Scribner's Magazine, New York.
Smith's Magazine, New York.
Street Railway Journal, New York.
Suburban Life, Boston.
Success, New York.
Sunset, San Francisco.
Surveyor, London.
Technique Sanitaire, Paris.
Times Magazine, New York.
Tradesman, Chattanooga.
Travel Magazine, New York.
Van Norden's Magazine, New York.
Village, Hyde Park, Mass.
Water, London.
Water and Gas Review, New York.
World To-day, Chicago.
Western Municipal News, Winnipeg.
World's Work, New York.

ROADS AND PAVEMENTS

Suburban Roads. Discussion of Cuban requirements and methods of meeting them. 3 pp. Revista Municipal, May 1, and 15.

"Village Streets and Roads." Good advice for villages. By R. DeL. French. 2 pp. The Village, May.

Michigan State Roads; Specifications for. 2 1-2 pp. Engineering World, May 10.

Roads in Parks. Some data concerning those near Boston. Illustrated. 3-4 p. Municipal Journal and Engineer, May 15.

Dust Laying by Salt Solutions.—Brief discussion. 3-4 p. La Technique Sanitaire, May 1.

Dust Reducing and Road Hardening by Surface Applications. Abstract of paper by J. W. Howard. 2 1-2 pp. Engineering Record, May 11.

Dust Prevention in England, "The King's Highway." Reginald Ryves. 2 1-2 pp. The Surveyor, May 10.

Oiled Roads, Constructing and Repairing in California.—Abstract from report of State Highway Commissioner N. Ellery. 1 1-2 pp. Engineering-Contracting, April 24. 1 1-2 pp. Engineering World, April 26. 1 1-2 pp. Good Roads, May.

Tar as a Dust Palliative.—General statement. 1 p. Local Government Officer, May 4.

Tarring Macadam and Clay Roads. Methods and cost at South Haven, Mich. Illustrated. 1 1-4 pp. Engineering-Contracting, May 8.

Road Tarring Statistics. Collected by F. G. Carpenter in England from a large number of cities. Tabulated. The Surveyor, April 19 and 26, May 3 and 10.

Tar Macadam and Tar Painting. Reports of various engineers concerning. 1 p. Local Government Officer, April 13.

Oyster Shell Roads.—Discussion of their use in Salem County, N. J., by the county engineer, Josiah Miller. 1-3 p. Engineering Record, April 27. 1 1-3 pp. Engineering-Contracting, May 1.

Bitulithic Paving in St. Louis.—Failure of. Illustrated. 2 pp. Clay Worker, April.

Brick and Bitulithic Paving, Cost of, in Hattiesburg, Miss. Engineering World, May 17.

Paving Brick, What Constitutes a First Class. Paper before Illinois Clayworkers' Association, by W. P. Blair. Illustrated. 2 pp. Clay Worker, May.

Concrete Roadways.—Description of construction at Richmond, Ind. H. S. Weber. 2 pp. Rock Products, April 22. 9 pp. Cement Age, May.

Cement Concrete Roads. Description of the Hassam pavement. Walter E. Hassam. 2-3 pp. Rock Products, April 22. 2 pp. Cement Age, May.

Australian Wood Paving.—General discussion of its use. 3 pp. Gesundheits-Ingenieur, March 9.

Asphalt Pavements, Maintenance of. —General discussion and advice to cities. S. Whinery. 2 1-2 pp. Engineering News, May 9.

Recent Asphalt Literature. Paper before Society for Chemical Industry, by S. F. Peckham. 12 pp. Chemical Engineer, April.

Brooklyn Municipal Asphalt Plant. Description of new plant. Illustrated. ¾ p. Engineering Record, May 11.

Skidding on City Pavements, To Reduce.—Paper before Conference of Road Engineers and Users (England), by E. B. B. Newton, Douglas Mackenzie and E. Shrapnell Smith. 3 pp. The Surveyor, April 19.

Road Bridges.—Timber and reinforced-concrete bridges. "The King's Highway." Reginald Ryves. 2 1-2 pp. The Surveyor, May 17.

Tire Width and Road Wear.—"The King's Highway." Illustrated. Reginald Ryves. 3 pp. The Surveyor, May 3.

Drags in Road Maintenance.—De-

scription of work done with split-log, timber and other forms of drag. Illustrated. 2½ pp. Good Roads, May.

Care and Maintenance of Highways in Connecticut.—Description of State methods, laws, etc. Illustrated. Jas. H. Macdonald, State Highway Comm'r. 6 pp. Good Roads, May.

New Jersey Road Improvement and Repairing. Abstract from 1906 Report of Comm'r of Pub. Roads. Illustrated. 3 pp. Good Roads, May.

Account Keeping of Road Maintenance.—Full description of method employed in Mercer County, N. J. Forms, blanks, etc. Frank J. Eppele, County Eng. 6 pp. Good Roads, May.

Cost of Macadam Streets in Easton, Pa., in detail.—Also of tarviating. Abolishing catch-basins. 1¼ pp. "Municipal Journal and Engineer," May 15.

Road Engineers' Conference.—Papers on tar painting, oiling, legislation, etc., in England. 2½ pp. The Surveyor, May 3. 1½ pp. The Surveyor, May 10.

American Road Makers' Association. —Papers before Fourth Annual Convention, including descriptions of work in Maine, Rhode Island, Florida and Delaware. 4 pp. Good Roads, May.

Petitions for Paving, Contractors Opposed to.—½ p. Clay Worker, April.

Paving Materials, Selection by Citizens. Editorial. ¾ p. "Municipal Journal and Engineer," May 15.

Tar Sidewalks in Pittsfield, Mass.—Data concerning. ½ p. "Municipal Journal and Engineer," May 8.

SEWERAGE AND SANITATION

Sewerage Construction Work.—Trench excavators; steel sheeting; pipe jointing. Illustrated. 3 pp. "Municipal Journal and Engineer," May 1.

Sewer Siphon Under a 16-Foot Conduit, Method of Constructing. Illustrated. 1½ pp. Engineering-Contracting, May 22.

Sewerage Pumps and Lifts.—Steam, gas, gasoline, Shone ejectors, Ellis ejectors, Adams lift, Wilson's ejector. Illustrated. 4½ pp. "Municipal Journal and Engineer," May 1.

Sewage Disposal in England.—Editorial on present status of. 1 p. The Surveyor, April 26.

Sewage Disposal Plant at Hamilton, England. Septic tanks and filters. 1 p. Water, April 15.

Sewage Disposal Plant at Johnson City, Tenn. Septic tank and contact beds. 1¾ pp. Engineering Record, April 27.

"Big Four" Sewage Disposal Plant. Illustrated brief description. 1 p. Engineering World, May 3.

Septic Tanks.—Description of those at Newton, N. J., and Bellville, Ill. Illustrated. 3½ pp. "Municipal Journal and Engineer," May 1.

Importance of Septic Tanks for Sewage Purification. Illustrated. S. K. Dzierzgowsky. 18 pp. Gesundheits-Ingenieur, April 27, May 4.

Sprinkling Filter Motor.—Description of English invention. Illustrated. 1-4 p. Engineering News, May 2.

Sewage Distributor, Fiddian. Description of apparatus for sprinkling filters. Illustrated. ¾ p. "Municipal Journal and Engineer," May 29.

Disintegration in Trickling Filters. Illustrated. 2 pp. Gesundheits-Ingenieur, April 6.

Sterilizing Sewage.—"Prevention of the Bacterial Contamination of Streams and Oyster Beds." Paper before Society of Engineers, by Digby and Shenton. (Concluded.) 3¾ pp. Water, April 15.

Sterilizing Sewage Effluents. Abstract of paper by E. B. Phelps and Wm. T. Carpenter. ¾ p. "Municipal Journal and Engineer," May 1.

Nitrifying Beds; Their Construction and Working.—Presidential address before Ass'n of Managers of Sewage Disposal Works, by Geo. Reid. Technical review of English experience. 4 pp. The Surveyor, April 26.

Standard Sewerage Reports.—Forms for, proposed by Am. Soc. of Municipal Improvements and Boston Society of Civil Engineers. 1 p. "Municipal Journal and Engineer," May 1.

Sewage Assessments.—Method employed at West Hartford, Conn. Abstract of paper before Connecticut Society of Engineers, by A. B. Alderson. ½ p. "Municipal Journal and Engineer." May 1.

Catch Basins. Useless Use of.—Editorial. ¼ p. "Municipal Journal and Engineer," May 1.

Stream Pollution by Distillery Refuse. Prevention of.—Report of investigation of case at Lynchburg, O. ½ p. Engineering Record, April 27.

Pollution of New York Harbor. Address before New York Co. Homeopathic Medical Ass'n, by Geo. C. Whipple. Illustrated. 2¾ pp. Engineering News, May 23.

Pollution of the Thames Estuary. Conference looking to preventing it. ½ p. Local Government Journal, May 18.

Plumbing Regulations: State or City Control.—Discussion advocating State regulation. John B. Duncklee. 1 p. Engineering Review, April.

Plumbing Precautions to Prevent Pollution of Water in the Pipes. Illustrated. 3½ pp. Gesundheits-Ingenieur, Feb. 16.

Transportation of Sewage Bacteria into drains, ventilating pipes, etc. Description of experiments made by the author. Illustrated. W. H. Horrocks. 12 pp. Public Health, May.

Contagious Diseases and Precautions for Dwellings. V. W. Matthes. 4 1-4 pp. Gesundheits-Ingenieur, March 9.

Death Rates in the U. S. Statistics concerning mortality, typhoid rates, malaria, etc. 1 1-4 pp. "Municipal Journal and Engineer," May 22.

Food Inspection and Laboratory. Description of work and chemical and bacteriological laboratory at Birmingham, Ala. E. M. Duncan, bacteriologist and chief inspector. Illustrated. 3 pp. "Municipal Journal and Engineer," May 1.

Meat Inspection in Dublin. Description by the veterinary inspector, A. Watson. 10 1-2 pp. Journal Royal Institute of Public Health, April.

London Milk. Description of present conditions. J. Wicliffe Peck. 7 1-2 pp. Journal Royal Institute of Public Health, April.

WATERWORKS

Water Supply Systems. Consolidated system supplying Oakland, Cal., and neighboring towns. "Some Water Facts." 3 pp. Illustrated. Sunset, May.

Los Angeles' Proposed Owens River Water Supply. 2-3 p. Water and Gas Review, May.

Atlanta's Water Works. General description of management and finances. H. C. Beck. 2 1-2 pp. Water and Gas Review, May.

Waterworks Construction in America. The Natick, Franklin, Louisville and Rockford reservoirs described in a paper before the (English) Society of Engineers, by Ernest R. Matthews. 3 pp. The Surveyor, May 10.

Montreal's Water Supply. Description, with maps. 1 p. Contract Journal, April 24.

Waterworks of Oldham. Description. Illustrated. (Continued.) 1 1-2 pp. Local Government Officer, May 4.

Water Supply of Berlin. History and description of present plant. Illustrated. 6 1-2 pp. Gesundheits-Ingenieur, January 26.

Hongkong Waterworks System. Description of dam, filters, etc., now nearing completion. Illustrated. 3 pp. Far Eastern Review, March.

Reservoirs and Dams.—Ashokan Reservoir, New York's Catskill Supply. Plans briefly described. Illustrated. 1 1-2 pp. Engineering News, May 9. Map, section of dam. 1 1-4 pp. Engineering Record, May 11.

Earth Dams. Paper by H. G. Coventry before Students of Inst. of Civ. Engineers. Illustrated. 3 3-4 pp. Water, April 15.

Wachusett Reservoir. Earth Slip in Face of Embankment of North Dike of. Illustrated. Caleb Mills Saville. 2 pp. Engineering News, April 25. 1 p. Engineering Record, April 27.

Reinforced Concrete Reservoir. Description of 2,000,000 gallon reservoir at Suton, England. Illustrated. 1 1-4 pp. The Surveyor, May 17.

Reinforced Concrete Dam at Ellsworth, Me. Description of an Ambursen dam 420 feet long 71 feet high. Illustrated. 1 1-2 pp. Engineering News, May 23.

Dam of Lynchburg Waterworks, Pedlar. Description. Illustrated. 1 p. Fire and Water, May 22.

Expansion Joints in Reservoirs and other Concrete Structures. Theory, examples and proposed construction methods. Illustrated. L. F. Bellinger. 3 pp. Engineering News, May 2.

Underground Water.—English law concerning. Paper by W. Vaux Graham. 1 1-4 pp. The Surveyor. April 19.

Well Water Supplies in Michigan. General description of conditions. Illustrated. 1 p. Municipal Journal and Engineer, May 29.

Pollution of Ground Water by the Wastes from a Resin Distillery. Dr. Kammann. 3 1-2 pp. Gesundheits-Ingenieur, February 16.

New Method of Determining Direction and Velocity of Ground Water Flow. Illustrated. Reinhold Ulfert. 4 pp. Gesundheits-Ingenieur, March 23.

Mineralization of Underground Waters. Discussion of relation of this to distance traveled. M. F. Dienert. 1 1-4 pp. Technique Sanitaire, May.

Potable Water for Cities.—Source of Supply. Report to National Congress of Hygiene and Public Health, Marseilles, by M. Felix Marboutin. 5 1-2 pp. Technique Sanitaire, April.

Biology of Potable Waters.—From Annales de la Société Zoologique et Malacologique de Belgique. (Continued.) Ad. Kenna. 3 1-2 pp. Technique Sanitaire, April. 4 pp. May.

Water Filtration in Japan. Notes on works at Tokyo, Yokohama and Osaka. Illustrated. 3 pp. Geo. A. Johnson. Engineering Record, May 11.

Lawrence Filter, Collapse of Roof Arches of. Description of work and accident. Illustrated. 1 3-4 pp. Engineering Record, April 27.

Harrisburg Filter Plant. Brief description. 1 3-4 pp. Fire and Water, May 15.

Jewell Filter. Report on experiments made on a test plant. Written by Karl Schreiber, translated by F. Briot. Illustrated. 7 1-2 pp. Technique Sanitaire, May.

Filter Plant, Operation of New Haven Water Co.'s. Paper before Connecticut Society of Engineers, by Chas. A. Ferry. Illustrated. 1 1-4 pp. Engineering News, May 9.

Sand Filters for Removing Organisms, Tastes and Odors. Description of those at Bar Harbor, Me., and So. Norwalk, Conn. H. W. Clark, Chemist, State Bd. of Health. 1 p. Engineering News, May 23.

Ozone; Its Nature, Production and Use. History and technical description. Illustrated. Jas. Howard Bridge. 26 pp. Journal of the Franklin Institute, May.

Water Softening, Notes on. Paper before Indiana Engineering Society, by W. D. Collins. 5 pp. Chemical Engineer, April.

Ice, Pollution and Purification of.—Abstract of report of New York State Health Commissioner Eugene H. Porter. 1 3-4 pp. Municipal Journal and Engineer, May 8. 1 1-2 pp. Engineering News, April 25.

Electrolysis in Boston, Effect of Three-Wire Operation on.—Abstract of paper before Am. Inst. of Electrical Engineers, by Paul Winsor and John W. Corning. Illustrated. 2 pp. Street Railway Journal, May 18.

Leaks in Water Mains, Discovering.—Indications given by frost and snow. 1-3 p. Municipal Journal and Engineer, May 15.

Rust in Water Mains; Means of Protection and Prevention.—Von H. Wehner. 7 1-2 pp. Gesundheits-Ingenieur, April 20.

Calculating Areas of Conduits, Simple Method of Quickly.—With diagrams. Dr. Imhoff. 1 1-4 pp. Gesundheits-Ingenieur, March 30.

Fire Hydrants.—Cost of Placing Cregier Hydrants in Chicago, itemized. 1-2 p. Engineering-Contracting, April 24.

Water Meters.—Discussion of advantages. 1 1-4 pp. Technique Sanitaire, May.

STREET LIGHTING AND ELECTRIC POWER

Electric Light Plant at Hagerstown, Md., Municipal.—Description and finances. Illustrated. 2 pp. Municipal Journal and Engineer, May 8.

Lighting Statistics.—Growth of electric lighting between 1900 and 1905. 1-4 p. Municipal Journal and Engineer, May 29.

Electricity Rates.—Abstract of evidence of E. W. Burdette on theory and basis of establishing rates. 1-2 p. Municipal Journal and Engineer, May 22.

Candle-Power Rating in Street Lighting.—Decision in Colorado Springs case. 1-3 p. Engineering News, May 2.

Power Costs. Discussion of cost of generating electricity by water power, oil, steam and gas. Paper before Am. Electrochemical Society, by Chas. E. Lucke. 3 1-4 pp. Electrical Review, May 18.

Direct-Current Transmission System for Paris. Suggested power plant, etc. 1 p. Electrical Review, April 27.

Gas, Quality Regulations for New York.—Report of committee of Empire State Gas and Electric Association on illuminating value and purity. 2 3-4 pp. Progressive Age, May 15.

Back to Coal Gas. Change from water gas caused by increased cost of gasoline. 1 3-4 pp. Water and Gas Review, May.

FIRE AND POLICE

Police Court; "What Good Does it Do?"—A protest against police court methods and an appeal for love in society. By Brand Whitlock, Mayor of Toledo. 11 pp. Illustrated. Everybody's, May.

"The New York Police."—An account of their organization, temptations and graft system. By L. B. Stowe. 8 pp. The Outlook, May 4.

Editorial Discussion of the Above: "Radical Remedies." 2 pp. The Outlook. May 4.

Fire Boat Protection in Greater New York.—Illustrated. 1 1-4 pp. Fire and Water, April 27.

Fire Engine, Novel English.—Supplies air to firemen, electric light, etc. Brief description. Firemen's Herald, May 11.

Fire Conditions in Prominent New York Buildings.—Illustrated. 1 3-4 pp. Fire, April.

Water Supply Systems for Fire Protection, Independent.—Abstract of report to Hartford Council by special committee. 2-3 p. Engineering Record, May 11.

GOVERNMENT AND FINANCE

Municipal Ownership.—Current news notes of. The Arena, May.

Municipal Ownership in Italy. Bakery, etc., at Palermo. 1-2 p. Municipal Journal and Engineer, May 15.

The Problem of Municipal Ownership. The four possible relations between the municipality and the public utility. Editorial. 2 pp. The Outlook, May 11.

The Subsidized Campaign Against Municipal Ownership. A circumstantial account of how some newspaper opposition is secured. 3 pp. Illustrated. Collier's, May 4.

"Municipal Ownership Problem Solved." A plea for public control and private operation. By Allen Ripley Foote. 7 pp. Moody's Magazine, May.

Municipal Ownership. Report of committee of Am. Street and Interurban Railway Association. 2 3-4 pp. Electric Railway Review, May 11. 6 1-4 pp. Street Railway Journal, May 11.

Municipal Ownership of Transportation Lines. (Continued.) 1 1-2 pp. Revista Municipal, May 1.

Municipalization in Canada. Quotation and discussion of paper by Mayor Griesbach, of Edmonton. 1 1-2 pp. Revista Municipal, May 15.

Initiative and Referendum.—"Oregon's Big Stick." Detailed story of the campaign to secure. By Lute Pease. 14 pp. Illustrated. The Pacific Monthly, May.

Municipal Laws, State of Iowa, Passed this year. 10 1-2 pp. Midland Municipalities, April.

The Galveston System Briefly Explained.—1 1-2 pp. Revista Municipal, May 1.

Corruption in Municipal Government and Its Correction.—Editorial. 5 pp. The Craftsman, May.

"Political Duties of the Citizens."—By Arthur Twining Hadley, President of Yale University. 6 pp. Munsey's, May.

"Chicago's New Mayor."—By George C. Sikes. 3 1-2 pp. Illustrated. Review of Reviews, May.

"Hearst-McClellan Imbroglio."—Summary of an article by Ervin Wardman in the Broadway Magazine for April. 2 pp. Illustrated. Review of Reviews, May.

Experiments in Municipal Government in Texas, Des Moines and Newport.—"Municipal Efficiency." Editorial. 1 p. The Outlook, May 25.

Education in City Government. "Progress City."—An account of the model juvenile city conducted at Hiram House Social Settlement in Cleveland. By Charles J. Bushnell. 4 pp. Illustrated. The World To-day, May.

Public Service Corporations and the Public.—Expounding of the relations between the two. Wm. A. Bancroft, President Boston Elevated Railway Co. 1 2-3 pp. Progressive Age, May 1.

Municipal Taxation.—Synopsis of paper read before Montreal Political Economy Club, by J. R. Walker. 1 1-2 pp. Canadian Municipal Journal, May.

Municipal Taxation in Saskatchewan, Modes of, explained. J. Kelso Hunter. 1 p. Canadian Municipal Journal, May.

Municipal Bond Sales.—Data concerning the sales during March and financial statistics of cities. 1 p. Municipal Journal and Engineer, May 1.

Depreciation.—Especial reference to public accounting. Lecture before Accountant Students' Society of London. By Prof. L. R. Dicksee. 2 pp. Am. Gas Light Journal, May 20. 3 pp. Municipal Journal, April 19 and 26. 1 p. Local Government Journal, April 20.

Depreciation and Expired Outlay on a Productive Plant. Exhaustive discussion, with plea for better methods. P. D. Leake. 7 pp. Contract Journal, April 24, May 1, May 8. 1 1-4 pp. Local Government Journal, April 27.

REFUSE COLLECTION AND DISPOSAL

Disposal of Garbage at Lowell.—Cremation and sale to farmers. 1-4 p. Municipal Journal and Engineer, May 15.

Municipal Garbage Reduction Works of Cleveland, O. Discussion of report. 2 1-2 pp. Engineering News, May 2.

Disposal of Municipal Waste. Description of Dixon, Davis, Pearce, Decarie and Thackeray furnaces. Illustrated. W. F. Morse. 4 1-2 pp. Municipal Journal and Engineer, May 1.

Spring Cleanings.—Plea for regular cleaning to avoid necessity for these. 1 p. Municipal Journal and Engineer, May 29.

PARKS AND CITY BEAUTY

"Park Improvements."—Brief news items. 2 pp. Park and Cemetery, May.

"Suburban and Mountain Parks in Massachusetts." An account of the reservations secured by the Metropolitan Park Commission of Boston. By Edward Kirk Titus. 8 pp. Illustrated. Review of Reviews, May.

"New York's Proposed Bronx River Parkway." 3 pp. Illustrated. Review of Reviews, May.

"The Amusement Park." A clever essay on its attractions. By Rollin Lynde Hartt. 11 pp. The Atlantic, May.

"Park and Boulevard Improvement in Ottawa." An article compiled from a recent paper by Mayor Ellis and a report of the Ottawa Improvement Commission. 3 pp. Illustrated. Park and Cemetery, May.

Art Commission.—Report of New York. 1-2 p. Notes and Comments department, Architectural Record, May.

Municipal Art Society of New York. Statement of aims, methods and results. 2 pp. Canadian Municipal Journal, May.

City Plans of St. Paul, St. Louis and Boston.—"Ambitions of Three Cities." A review of recently issued reports. By Charles Mulford Robinson. 10 pp. Illustrated. Architectural Record, May.

Transforming Rio de Janiero, Brazil. "Making Rio de Janeiro a City of Palaces." 1 p. of illustrations, with descriptive text. Leslie's Weekly, May 2.

Reconstruction of Manila, Burnham's Plans for. The report and comments. Illustrated. 5 pp. Far Eastern Review, March.

Garden City Movement in England.—History and general description. Harold Craske. 1 1-2 pp. Canadian Municipal Journal, May.

Hampstead Garden Suburb. Description of proposed utopia. Illustrated. 1 1-4 pp. Municipal Journal, April 26.

Garden Cities in America. Statement of work of the Garden Cities Association of America. 3-4 p. Charities, April 27.

Trees, Street, in Ridgewood, N. J.—A general discussion with Ridgewood's experience as a text. By C. S. Valentine. 4 1-2 pp. The Village, May.

Proposed New Tree Law for Pennsylvania. Text of bill for creating Shade Tree Commissions in cities and towns. 1-2 p. Park and Cemetery, May.

Civic Improvements of New York.—Herbert Croly. 6 pp. Architectural Record, May.

Cathedral Buildings, The Revival of.—A review of recent constructions in the United States and Europe. By Russell Sturgis. 9 pp. Illustrated. Munsey's, May.

Mural Decorations, New, of John W. Alexander, in the Carnegie Institute of Pittsburg.—His subject, the labor and triumph of the city. Comment, by Charles H. Caffin. 12 pp. Illustrated. Harper's Monthly, May.

San Francisco's Opportunities Aside from the Burnham Plan.—"A City Beautiful." Editorial. 1 p. Sunset, May.

Monumental Bridges, Two Types of Appropriate.—The West Boston and the Charles Eliot bridges. 2 1-2 pp. Park and Cemetery, May.

"Ocean Beach Reservations for New York City."—By William H. Allen. 2 pp. Illustrated. Reviews of Reviews, May.

TRAFFIC AND TRANSPORTATION

Street Railway Situation in Cleveland.—Statement of present status. 1 p. Street Railway Journal, May 11.

Street Railway Problems in Toronto. Report of Bion J. Arnold. 1-2 p. Electric Railway Review, April 27.

Municipal Tramway Trust in South Australia. 1-2 p. Street Railway Journal, May 4.

Passenger Traffic in Greater New York.—Discussion of records for 1906. 2 pp. Engineering Record, May 11.

Track Elevation in Chicago.—The part played by concrete. Illustrated. John O'Neill. 4 pp. Cement World, May.

Rails for the Chicago Street Railways.—Specifications for new work now under way. 3-4 p. Engineering News, May 23.

Horse Cars in New York.—Excuses offered for continuing them discussed. Louis H. Pink. Charities, April 27.

Trail Cars in Denver, Operation of.—Illustrated. 5 1-2 pp. Electric Railway Review, May 4.

Street Car Fenders.—Decision of Mass. Railroad Commission of May 21. 3-4 p. Street Railway Journal, May 25.

"Gates of New York."—The New York Central and Pennsylvania undertakings. By Robert W. Bruere. 16 pp. Illustrated. The Outlook, April 27.

Hoboken Terminal of the D. L. & W. R. R.—By Kenneth M. Murchison, architect. 13 pp. Illustrated. Architects' and Builders' Magazine, May.

Municipal Ferry Terminals in New York.—4 pp. Illustrated. Architects' and Builders' Magazine, May.

"Hudson Tunnels and Their Terminals."—7 pp. Illustrated. Architects' and Builders Magazine, May.

New York Tunnels.—Present status of construction. 1 1-4 pp. Engineering World, May 10.

New York Subway Deadlock.—Relations of the city and the Interborough Company. Editorial. 1 1-2 pp. The Outlook, May 18.

New York's New Subways. No bids received for construction and ten more needed, Engineer Rice's report. 1 1-2 pp. Street Railway Journal, May 4. Electric Railway Review, May 4.

Air of the New York Subway.—Abstract of paper before Boston Society of Arts, by Geo. A. Soper. 3-4 p. Street Railway Journal, May 25.

Temperature Conditions of Underground Railways.—Discussion of experiments and tests in New York and Paris. H. Kayser. 2 1-4 pp. Gesundheits-Ingenieur, February 2.

"Chicago Election and the City's Traction Outlook."—An attempt to give the real meaning of the recent vote. By "an impartial observer." 4 1-2 pp. Illustrated. Review of Reviews, May.

Chattanooga Station.—Elevations and Plans. Three plates. American Architect, May 11.

Union Station, New, at Salt Lake.—3 pp. Illustrated. Sunset, May.

"The Union Station, Washington, D. C."—5 pp. Illustrated. Architects' and Builders' Magazine, May.

Transit and Terminals, Illustrations and short articles on. Architects' and Builders' Magazine ("Terminal Number"), May.

MISCELLANEOUS

Civic Improvement.—Notes on current news of. 2 1-2 pp. Notes and Comments department, Architectural Record, May.

Ibid. 1 1-2 pp. Park and Cemetery, May.

Ibid. 2 pp. Civic Improvement Department, Charities and The Commons, May 18.

Ibid. By Edward T. Hartman. 2 pp. Village Improvement and Improvement Societies department. The Village, May.

Obstacles to "Civic Improvements, the Case of New York." The great obstacle to rapid progress in civic betterment, and its overcoming. By Herbert Croly. 6 pp. Architectural Record, May.

Village Improvement Conference in Massachusetts. 1 p. Charities and The Commons, May 4.

Public Baths at Liverpool.—History and policy. Illustrated. 1 3-4 pp. Municipal Journal, April 19.

New City Bath House in Hanover. Illustrated description of a magnificent establishment. E. Stack. 11 pp. Gesundheits-Ingenieur, March 2.

Improvement Society Conferences.—Massachusetts and Rhode Island. 2 1-2 pp. Park and Cemetery, May.

"Some Things an Improvement Society Can Do." Extract from an address before the Alabama Commercial and Industrial Association. By Edwin Craighead. 1 1-2 pp. Park and Cemetery, May.

"Billboards and the Village."—3 pp. Illustrated. The Village, May.

"The Billboard Crusade." News items. 1 1-4 pp. Park and Cemetery, May.

Descriptions of Cities and Towns.—"Montclair (N. J.), the Beautiful." By H. W. Mathews. 5 pp. Illustrated. Suburban Life, May.

Rio de Janeiro. "The New Brazil." A tourist's impressions of the city. By Paul S. Reinsch. 8 pp. Illustrated. The World To-day, May.

"By-ways of London."—A visit to the smaller Christopher Wren churches. By Anna McClure Sholl. 3 pp. Illustrated. The Travel Magazine, May.

Valparaiso, So. America. "The Other San Francisco." By Arthur Ruhl. 2 pp. Illustrated. Collier's, May 25.

The Artists' Section of Paris. "From the Latin Quarter to Saint Cloud." By Rosina Emmet. 5 pp. Illustrated. The Travel Magazine, May.

"The Slums of Paris." A gruesome account of the Parisian underworld. By Vance Thompson. 15 pp. Illustrated. Outing Magazine, May.

"Chicago as Seen by Herself." Extracts from Chicago newspapers, supplementing the picture painted in "Chicago, a Study of the Great Immoralities," in McClure's for April. 7 pp. McClure's Magazine, May.

Honolulu. Brief description and statistics of the city. By Walter Gifford Smith. 2 1-2 pp. Illustrated. The Independent, May 2.

Houston, Texas. "An Inland Seaport." By Frank Putnam. 16 1-2 pp. Illustrated. New England Magazine, May.

"Cairo, Curious, and Its Manifold Attractions for the Tourist." By Harriet Quimby. 2 pp. Illustrated. Leslie's Weekly, May 30.

Hamilton, Ohio. "A Day in Howells's Boy's Town." By Colvin Dill Wilson and David Fitzgerald. 9 pp. Illustrated. New England Magazine, May.

A Typical Western Town, Social Life in. "The West at Home, II. In the Town." By Charles Moreau Harger. 5 1-2 pp. The Outlook, May 11.

Anonymous. "A Little Old Village." A charming account of a town and its people. By L. P. R. 3 pp. The Village, May.

Detroit and Its Buildings, Especially the management of the latter. Illustrated. E. C. Schmidt. 7 pp. Building Management, May.

Ontario, Cal. Description of this orange-grove city. Illustrated. Bertha H. Smith. 5 pp. Sunset Magazine, May.

Philadelphia's Decline in Maritime Importance. "The Decadence of America's First Seaport." An account of the Pennsylvania Railroad's destruction of water commerce. By John S. Lopez. 10 pp. Illustrated. Appleton's, May.

Municipal Work in a Small English Town.—Roads, sewers, refuse cremation, etc. Illustrated. W. W. Cooper. 3 pp. Contract Journal, May 15.

Municipal Works of Slough, England. Sewage and refuse disposal, roads, etc. W. W. Cooper. 2 pp. The Surveyor, May 17.

Public Work in Eton, England. Roads and sewers. Illustrated. Arthur Gladwell. 2 pp. Contract Journal, May 15. The Surveyor, May 17.

Municipal Works at Hamilton, Ontario. Waterworks, streets, sewers. Illustrated. From annual report of City Engineer E. G. Barrow. 3 1-2 pp. Municipal World, June.

Housing.—"A Co-operative Boarding House for French Telephone Girls." An account of the building recently constructed in Paris. 2 pp. Illustrated. Review of Reviews, May.

"Baltimore and Its Housing Secrets." Discussion of report from the City's Federated Charities. 1 p. Charities and The Commons, May 4.

Housing and Traffic Problems. Proceedings of a conference in London. 3-4 p. Local Government Journal, April 27.

Institutional Construction on the Cottage Plan.—"The Children's Village." An account of the New York Juvenile Asylum at Dobbs Ferry. By Walter Reece Evans. 4 pp. The Village, May.

Juvenile Courts.—Statement concerning practice in several United States cities. 3-4 p. Revista Municipal, May 15.

Municipal Statistics.—Valuation, taxes, etc., of Quebec cities. 1-2 p. Municipal World, May.

American and Canadian Cities Compared. Statistics of population, finances, etc. Wm. S. Crandall. 2 pp. Canadian Municipal Journal, May.

Lambeth Municipal Building. Description. Illustrated. 1 1-4 pp. The Surveyor, April 26.

Abattoir at Preston, England.—Plan and description. 1 1-2 pp. Local Government Officers, April 13.

"Packington To-day." An account of a recent visit to the Chicago packing houses and of the improvements found there. By Shailer Mathews. 15 pp. Illustrated. World To-day, May.

Smoke Abatement, Economy in.—An account of what is being accomplished. By S. S. Atkinson. 4 pp. Moody's Magazine, May.

Smoke Abatement. References to St. Louis, New York, Baltimore, Chicago and Milwaukee's experiences. 3 pp. Bulletin, League of American Municipalities, January.

Suppression of Smoke. Appliances for effecting this generally stated. Illustrated. 2 pp. Municipal Journal and Engineer, May 22.

Under-Feed Stoking. Description of appliances. Illustrated. A. Pradel. 7 pp. Gesundheits-Ingenieur, March 30.

Mosquito Breeding Places and Water Supplies.—General statement. 1 p. Water, April 15.

Highways Bridges, Electric Car Loads on.—Abstract of paper before Boston Society of Civil Engineers, by H. K. Higgins and its discussion. 3-4 p. Street Railway Journal, May 4.

Concrete Bridges in Philadelphia. General statement. Illustrated. Geo. S. Webster. 2 1-2 pp. Engineering World, May 10. 6 pp. Cement Age, May.

Concrete Arches with Old Rail Reinforcement at New Haven. Portion of paper Connecticut Society of Engineers, by C. L. Slocum. 1 1-2 pp. Engineering News, April 11.

Sandy Hill Bridge. Design, method of construction, plant, etc. Illustrated. 6 1-2 pp. Engineering News, May 9.

Wharves and Quays of Reinforced Concrete.—Descriptions of some at Paris and Dennemont. Illustrated. W. Noble Twelvetrees. 7 1-2 pp. Concrete and Structural Engineering, May.

Reinforced Concrete Regulations in Various Cities.—Comparison of those in five largest cities. 2 pp. Concrete, May 15.

Chicago's Subways.—Description, especially of the concrete lining. Illustrated. Geo. W. Jackson, Chief Engineer Illinois Tunnel Co. 5 pp. Cement World, April.

Pulling Steel Sheet Piling.—Possibilities and methods. Editorial, and abstract of paper before Michigan Engineering Society, by Wm. A. Fayo. Illustrated. 3 3-4 pp. Engineering-Contracting, May 1.

Patented Articles, Municipal Use of.—Review of Supreme Court decisions throughout the country. John Simpson. 2 pp. Municipal Journal and Engineer, May 29.

New York Bureau of Municipal Research.—Editorial. 2 pp. Charities and The Commons, May 18.

BOOK REVIEWS

International Association of Municipal Electricians.—Eleventh annual report. The report is a record of the proceedings of the convention held at New Haven, Conn., August, 1906. Besides the business proceedings the volume contains eight formal papers, questions and answers in the "question box," and reports of four committees.

Board of Health of the City of Lowell, Mass.—Twenty-ninth annual report, 1906. This report, as usual in reports of Boards of Health, is largely statistical. It is noticed, however, that of preventable diseases there were seven deaths from typhoid, as compared with seventeen for the previous year; forty from diphtheria, as compared with twenty for the previous year; 161 from tuberculosis, as compared with 170 in the previous year. Last June the Board decided to allow the public to inspect the records of all cases of tuberculosis, both those reported by physicians from clinical diagnosis and those in whose sputum the germ had been discovered by the bacteriologist.

Water Supply Commission of Pennsylvania.—Report 1905-06. In accordance with an act of the Legislature (1905) the Water Supply Commission was created and organized for the purpose of preserving and equitably distributing the water supplies of the State for the common good of its inhabitants. Since its organization eighty-eight applications for the incorporation of water companies have been received, of which thirty-seven have been approved, nine disapproved, two withdrawn, and the rest are in the course of investigation. The report, which is brief, deals with questions of equitable distribution and supply, obstruction of channels, influence of forests, reservoirs, water transportation and water powers.

State of Ohio, Highway Department, Sam Huston, Commissioner; Bulletin No. 8, Road Laws of Ohio. This bulletin was compiled and issued to meet the demand, which is said to be urgent and constant, for copies of the road laws of the State. Moreover, the department has found it essential in replying to inquiries as to the application and enforcement of the many road laws, to have at hand a complete and well-indexed compilation. The bulletin contains 188 pages of text and 32 pages of index.

Sanitary Legislation in the United States, being a special bulletin of the State Board of Health of Rhode Island. The book is a compilation of sanitary laws enacted in 1006 and includes legislation relating to the organization and duties of State and local Boards of Health, to quarantine and control of communicable diseases, preventive inoculations, the collection of vital statistics and the disposal of the dead, water pollution, the abatement of nuisances, the regulation of tenement and lodging houses, the sale of certain poisons and the regulation of certain occupations—as the practice of medicine, nursing, plumbing and barbering. The statutes are arranged by States and indexed by subjects. Charles D. Chapin, M. D., compiled the bulletin.

Administrative County of London.—Quinquennial valuation, 1905-06. It appears from this pamphlet that the ratable value of all public service undertakings in 1906, £4,812,748, represents 11 per cent. of the total ratable value of London, which is £43,486,436. The ratable value of railway undertakings alone represented 5.4 per cent., amounting to £2,357,014. Other chief items are: Gas, £895,742; electricity, £379,083; water, £684,584, and docks, £217,907.

London County Council.—Fire Brigade, County of London. Report of the Fire Brigade Committee for the year 1906. The total number of fires reported was 3,843, of which 65, or 1.69 per cent., were classed as serious. The total number of lives lost due to fires was 104, 64 of whom were dead or had been removed before the brigade arrived, and of the other 40, 20 were rescued alive by the firemen, but succumbed afterward. Regarding the means by which fires were extinguished, 1,800 were extinguished by small appliances, 582 by pressure from mains, 97 by steam engines, and 5 by river appliances. The department is proceeding gradually in the direction of motor traction for brigade appliances and a new fire station, the second of its kind, at Lee Green, has been equipped entirely as a motor station. The total expenditure of the brigade was, on capital, £91,514, and on maintenance £247,692. As to causes of fire, 816 are attributed to lights thrown down, 100 to defective electric circuits, 167 to children playing with matches, and 26 to spontaneous ignition.

London County Council.—Sanitary officers. This is a report by the medical officer on the sanitary staffs of the metropolitan boroughs. Of the 319 inspectors now employed in London 38 are women—an increase of 10 since the last report. The women are concerned with inspection of workshops and outworkers' home, where female labor is employed. They also give instructions to mothers on the feeding and care of infants.

London County Council.—Indication of Houses of Historical Interest in London, Part XI. The houses indicated by suitable tablets and described and illustrated in this booklet are those of William Wilberforce, Sir David Wilkie and Samuel Rogers.

Municipal Reports, Portsmouth, Va., including the Mayor's message, 1906.—The annual receipts and disbursements amounted to $292.073. The total bonded indebtedness is $1,031,800. The total assessed valuation of property is $8,383,724. The sinking fund account is $21,246.

LEGAL NEWS

A Summary and Notes of Recent Decisions—Rulings of Municipal Interest

SEWER ASSESSMENT

Dickey vs. **Porter et al.**—The action was to enforce a tax bill issued in 1896 by the Board of Public Works of Kansas City, Mo., in part payment of an assessment for the construction of a sewer. The tax bill was payable in four annual installments of $2,446.98 each. On appeal of the defendant to the Supreme Court it was held that the defendants were estopped to assess a claim made under a general denial that plaintiff did not acquire ownership of the special tax bill sued upon, when, in an affirmator defense, they alleged plaintiff, before bringing the action, assigned the bill to another, who assigned it to a bank. Evidence in an action upon a special tax bill was held to sustain a finding that the original holder assigned it to plaintiff. That the plaintiff had pledged the special tax bill sued upon as collateral security for a note for a less sum, there being no default in the payment of the note, did not prevent him from suing to enforce the tax bill, and under the statute requiring actions to be prosecuted in its name of the real party in interest, the action was properly brought by him at law. Under the Kansas City Charter Act all special tax bills must be made out and certified by the president of a board, or in his name, by any person authorized by resolution, and a clerk was authorized to perform that function. It was held that a tax bill was not void because the clerk did not make out the bill, but merely signed his name under the president's, which was executed by another clerk. The City Charter provides a board shall compute the whole cost of a district sewer, apportion it against the lots of land in the districts according to their respective area, and issue a tax bill against each lot to the contractor, but does not specify the contents of the bill. Held that a bill was not void for failing to recite the total area of lands in the district subject to assessment, or any affirmator or general statement that the specific land was charged according to its area; it being unnecessary for the bill to show on its face every step essential to its validity. An objection that a special tax bill sued upon is void upon its face was not timely made where the answer did not plead such defect, where no objection was made to the bill's introduction in evidence, and the court was not asked to declare it void. That a sewer contractor contracted with plaintiff, from whom he borrowed money, to assign tax bills to be received for a public improvement, and plaintiff employed an engineer to see that the work was done so as to sustain the validity of the tax bills, did not show a transfer or subletting of the contractor's contract with the city, in violation of its terms. Where, in an action on a special tax bill, defendants did not object when the bill was offered in evidence that the contract under which plaintiff acquired it from the original holder was usurious, and did not plead or ask a declaration of law that it was usurious, the objection cannot be determined on appeal, since the statutes prohibited the Supreme Court from regarding any exceptions except such as have been expressly decided by the trial court. When an ordinance provides a sewer shall be constructed in conformity to plans and specifications on file in the office of the Board of Public Works, the plans and specifications are as much a part of the ordinance as if set forth therein in detail. Though a city charter requires sewers to be of such dimensions, material, etc., as shall be prescribed by ordinance, a tax bill issued for a sewer improvement was not void because the ordinance did not specify the thickness of the sewer pipe, where the form of contract on which the bidding was based and which was entered into specified the thickness, and it had been the uniform custom for years to use but one character of pipe; there was no pretense that the contractor used an inferior quality. On appeal on a suit upon a special tax bill issued for a sewer improvement, its validity is not open to question because the ordinance ordering the improvement did not specify the thickness of the pipe to be used, where the objection was not raised by answer, and the declarations of law asked presented no such issue to the circuit court. A special tax bill for a sewer improvement was not void because the ordinance ordering the improvement did not specify the amount of masonry to be used in the improvement; it appearing that that could only be determined while excavating in the construction of the improvement, and that only an estimate could be made—the contract price being based on cubic measurement. Since the charter allows 10 per cent. interest, when the debtor in a special tax bill issued for a sewer improvement fails to pay it when due, and provides judgment shall bear the same rate of interest as the tax bill, when defendant defaulted in the payment of such a bill, the judgment probably bears 10 per cent. interest.—Supreme Court of Missouri.

PARK LAW UNCONSTITUTIONAL

Vallelly vs. Board of Park Commissioners, Park District of City of Grand Forks.—This was an action to restrain the commissioners from issuing bonds in the sum of $25,000 for park purposes. The commissioners were appointed under an act of the Laws of 1905 creating park districts. The plaintiffs challenged the constitutionality of the law under a number of counts. It was held that debts of a city contracted for paving and sewer purposes are not to be computed in ascertaining whether the debt limit has been exceeded. There is no general liability against the city for such indebtedness, except for one-fifth of the cost of paving. That bonds issued by an independent school district of the city of Grand Forks are not to be computed as debts of the city in ascertaining whether the debt limit has been exceeded. That a law empowering a city council to determine by a vote whether the city will avail itself of the provisions of the law is not unconstitutional as a delegation to the council of legislative power. That the fact that the 1905 law creates a board to be appointed by the council, whose powers over the control and government of parks are the same as those conferred by law upon the city council by former laws, does not render the 1905 law invalid. That a municipality has power to provide for the payment of annual interest on bonds to be issued by it, although the law authorizing the issue of such bonds does not expressly authorize it to make provision for the payment of such bonds or annual interest thereon. That an act of the Legislative Assembly authorizing a board appointed by the City Council without the consent of the people to levy general taxes is unconstitutional as a delegation of Legislative power.—Supreme Court of North Dakota.

WHOLESALE WATER RATES

Jersey City vs. **Kearny.**—The suit was for water delivered to Kearny by Jersey City during several periods from February, 1902, to August, 1903. A total of 248,580,130 gallons of water were delivered, for which Jersey City demanded $90 per 1,000,000 gallons. Jersey City had a contract to furnish water from 1887 to 1897 at the price claimed, but that contract was never renewed. The question raised as to whether Jersey City had the right to recover at all because she did not own or control the waterworks was held to be an improper question for Kearny to raise, although a tax payer might contest the validity of the contract. As to price, Kearny claimed Jersey City was paying $35 per 1,000,000 gallons for the water, and that to charge Kearny $90 for it was inequitable. Judge Fort said that it appeared from the evidence that Kearny paid exactly the same price after Jersey City had ceased to supply the water. The price was the same as paid by a neighboring town. Even now Kearny pays another company $82 per 1,000,000 gallons. Judgment for $22,472, with interest, was rendered.—State Supreme Court.

SETTLEMENT OVER TRENCH

Cunningham vs. **Dady.**—The defendant laid water mains in a trench in a street for the Borough of Brooklyn and filled up the trench. The plaintiff afterwards walking over or by the trench fell in owing to the sinking of the earth. Though the doctrine of "res ipsa loquities" was applicable, the burden was not on the defendant to prove by a preponderance of evidence that he was not negligent, since, if plaintiff's case was supported only by the presumption of negligence and it did not preponderate over defendant's evidence, the plaintiff could not recover. In this case as there was no leak in the main or other cause beyond the defendant's control for the cave-in, the doctrine of "res ipsa loquities" applied. The judgment of the trial court for the plaintiff was confirmed.—Appellate Division, Supreme Court of New York State.

CHANGE OF GRADE

Kimball vs. Salt Lake City.—The Court establishes the precedent that the party whose property is injuriously affected by any change of grade may recover damages to the extent that the diminution in the value exceeds the direct benefit derived.—Supreme Court of Utah.

NEWS OF THE SOCIETIES

Toledo Society of Engineers.—The third annual meeting was held, May 25, at the Toledo Club, where a banquet was served to fifty guests. After the banquet T. R. Wickenden, toast master, introduced A. H. Smith, President of the Society, who responded to the toast, "Our Organization," and told briefly of the growth and lines of work of the Society. E. O. Fallis then spoke on the theme, "Our City Beautiful," and urged particularly the group plan of erecting public buildings, and called attention to the fact that in Toledo there is now absolutely no system of erecting either public or private structures. Mayor Brand Whitlock spoke in defense of the "dreamer," quoting the poet to the effect that "A dreamer lives forever, but a toiler dies in a day." As the result of dreams the Mayor predicted that cities will become better and kindlier places in which to live. City Solicitor Charles S. Northrup spoke on the proposed Swan creek improvement, expressing the opinion that the city would be the gainer by the improvement through increased taxes. R. J. Kaw predicted that the draining of sewage into rivers would be prohibited by the State Board of Health in ten years. Under the title of "Going Below," M. J. Riggs described recent tunnel work and the need of tunnels in Toledo under the Maumee. W. T. Sherman responded to the toast, "The Social Side."

Georgia League of Municipalities.—The annual session took place at Athens, Ga., May 28, and was attended by representatives from sixty-four cities and towns. The welcome in behalf of the city was extended by Mayor William F. Dorsey. Mayor John W. Maddox, of Rome, responded in behalf of the League. President Chappell at the business meeting recommended that in future a committee be appointed to prepare the programs for future meetings. The papers presented were: "Municipal Sanitation," by Dr. James C. Bloomfield, of Athens; "Municipal Courts," by Recorder Gerry Cataniss, of Macon; "Harmony a Potent Factor in Municipal Government," Mayor Colvard, of Dalton; "Public Works of a City," by Hon. H. L. Collier, Commissioner of Public Works, Atlanta; "Protection of Property From Fire," by Mayor W. R. Joyner, Atlanta; "Municipal Care and Culture of Trees," by Hon. R. C. Berkmans, Augusta, Ga.; "Municipal Care of Indigent Sick," by Dr. T. D. Songino, Atlanta; "Foreign Immigration," by Hon. John A. Betjeman. The social features of the meeting included a barbecue prepared by eleven ex-mayors of the city of Athens. The following officers were elected for the ensuing year: President, J. A. Sims, of Richland; First Vice-President, H. V. Colvard, of Dalton; Second Vice-President, John W. Maddox, of Rome; Third Vice-President, J. D. Monk, of Moultrie; Fourth Vice-President, T. P. Fincher, of Fort Valley; Secretary and Treasurer, Bridges Smith, of Macon, elected for life. The city of Albany, Ga., was chosen as the place for the next meeting.

League of American Municipalities.—The Joint Council Committee on Entertainment of the League of American Municipalities at its first session at Norfolk, Va., after a general discussion, decided to leave to sub-committees the working out of details of the plans for entertainment. These sub-committees were designated by the Chairman of the Committee. They are expected to submit reports at the next meeting. In addition to City Engineer W. T. Brooke and Mayor J. G. Riddick, those comprising the joint committee are Messrs. Tazewell, Burke, Pritchard and Gwathmey, of the Common Council; and Messrs. Burwell, Miles and Consolvo, of the Board of Aldermen.

Municipal League of Indiana.—The seventh annual meeting of the League to be held June 18-20 in Logansport promises to be one of great interest. Mayor Bookwalter, of Indianapolis, and ex-Mayor Dunne, of Chicago, will speak. Chief of Police James McWeeny will speak upon the subject, "Would It Tend to Elevate the Standard of Municipal Officers to Eliminate Politics?"

Calendar of Meetings

June 4-7.
National Electric Light Association—Annual meeting, Washington, D. C.—W. C. L. Elgin, Secretary, 29 West 39th street, New York City.

June 4-6.
North Dakota Municipal League.—Convention in conjunction with the Civic Improvement Association, Valley City.

June 6-8.
League of Michigan Municipalities.—Ninth annual convention, Art Museum, Detroit, Mich.—John A. Fairlie, Ann Arbor, Secretary.

June 10.
Draymen's Protective Association of America.—Team owners' Convention, Minneapolis, Minn.—W. M. Babcock, Secretary, Pittsburg, Pa.

June 10-12.
American Portland Cement Manufacturers.—Meeting, Hotel Chamberlain, Old Point Comfort, Va.—C. Pearle E. Bottomly, Assistant Secretary, Land Title Building, Philadelphia, Pa.

June 11-12.
State Fire Chief's Association.—Convention.—H. R. Yates, Secretary, Schenectady, N. Y.

June 12.
National Conference of Charities and Correction.—Thirty-third Conference, Minneapolis, Minn.

June 17-22.
American Water Works Association.—Twenty-seventh annual convention, Toronto, Ontario, Canada.—Dabney H. Maury, President; J. M. Diven, Charleston, S. C., Secretary.

June 18.
International Association of Chiefs of Police.—Annual convention, Auditorium, Jamestown Exposition Grounds.—Major Richard Sylvester, President, Washington, D. C.

June 18-20.
Municipal League of Indiana.—Meeting, Logansport, Ind.—Councilman J. T. McNary, Chairman, Local Committee, Logansport.

June 20-22.
American Society for Testing Materials.—Annual meeting, Atlantic City, N. J.—Edward Marbury, Secretary, University of Pennsylvania, Philadelphia.

June 20-22.
The Playground Association of America.—First Annual meeting, Chicago, Ill.—Dr. H. S. Curtis, Secretary.

June 25-28.
American Institute of Electrical Engineers.—Annual meeting, Niagara Falls, N. Y.—Ralph W. Pope, Secretary, 29 West 39th street, New York City.

June 26-28.
International Association for the Prevention of Smoke.—Second annual convention, Milwaukee, Wis.—Charles Poetke, Smoke Inspector, Milwaukee, Wis.

July 8.
American Society of Civil Engineers.—Annual convention, Mexico City.—Charles Warren Hunt, Secretary, 220 West 57th street, New York City.

July 17-19.
National Electrical Contractors' Association.—Seventh annual convention, New York City.—J. C. Hatzel, Chairman, 671 Fifth avenue, New York, N. Y.

August 6-8.
American Association of Park Superintendents.—Annual convention, Toronto, Ont.—F. L. Mulford, Secretary, Harrisburg, Pa.

August 7-9.
The International Association of Municipal Electricians.—Annual convention, Jamestown Exposition, Norfolk, Va.—F. P. Foster, Secretary, Corning, N. Y.

August 20-23.
New York State Firemen's Association.—Convention, Elmira, N. Y.

September 17-19.
American Society of Municipal Improvements.—Annual convention, Detroit, Mich.—George W. Tillson, Secretary, 13 Park Row, New York City.

September 17-19.
League of Iowa Municipalities.—Tenth annual convention, Council Bluffs, Iowa.—T. G. Pierce, Secretary, Marshalltown, Ia.

September 19-21.
League of American Municipalities.—Annual convention, Jamestown Exposition.—John MacVicar, Secretary, Des Moines, Ill.

October 8-11.
International Association of Fire Engineers.—Thirty-fifth Annual Convention, Washington, D. C.

October 14-18.
American Street and Interurban Railway Association.—Annual convention, Atlantic City, N. J.—B. V. Swenson, Secretary, Engineering Societies Building, 33 West Thirty-ninth street, New York.

November 19.
National Municipal League.—Annual convention, Providence, R. I. (in conjunction with the American Civic Association).—Charles Y. Bonaparte, Secretary.

PATENT CLAIMS

853,637. Device for Recording the Reading of Meters. George E. Hawkins, Columbus, Ohio. Serial No. 315,188.

In a device of the character described, the combination with a meter registering mechanism, of a casing in which said meter registering mechanism is mounted, a transparent platen mounted to move in said casing toward the hands of the meter registering mechanism, said hands being normally visible through said platen, and a removable key journaled in portions of the casing in front of said platen and adapted to force said platen inwardly.

853,785. Safety Means for Fluid-Pressure Lines. George J. Henry, Jr., San Francisco, Cal. Serial No. 276,252.

The combination with a main line supply pipe or conduit, of a relief valve casing connected therewith, a pressure actuated relief valve held therein, an overflow outlet controlled by said valve, a settling reservoir or chamber connected with the main line pipe or conduit, of connections between said reservoir and the relief valve casing for establishing a pipe line pressure to hold the relief valve seated against normal pressure, and a pilot valve interposed within said connections, which valve is actuated in accordance with pressure variations in the pipe line or conduit to control the movements of the relief valve.

853,900. Pipe-Joint. Augustus M. Saunders, McKeesport, Pa., assignor to National Tube Company, Pittsburg, Pa., a Corporation of Pennsylvania. Serial No. 327,793.

A pipe joint consisting of a pipe having an integral enlarged end with a contracted mouth, a second pipe telescoped within the enlarged end and a flexible gasket around the telescoped portion of the pipe within the enlarged end, said gasket having an inwardly beveled face which is initially largely out of contact with the pipe and the enlarged end of said pipe having its wall inclined to act upon the outer side of said gasket and bring its inner surface into contact with the pipe under the action of the fluid pressure behind the gasket; substantially as described.

854,261. Motor-Car Traffic System. Robert T. Yates, Lytton Springs, Tex. Serial No. 355,910.

A motor car traffic system comprising a guide-rail for directing the line of travel of the motor car, a clamp for the same comprising a suitable supporting frame, clamping jaws, pivotal supports for the same, and converging guides for said jaws for moving them into operative relation with the guide rail.

854,366. Frost-Proof Conduit. Herbert H. Macomber, Kendallville, Ind., assignor to Flint & Walling Manufacturing Company, Kendallville, Ind., a Corporation of Indiana. Serial No. 357,780.

A non-conducting jacket comprising alternately compressible units and independent rigid air chamber units and means firmly uniting the units.

854,680. Street-Flushing Apparatus. Charles E. Wiberg, Ashland, Wis., assignor of one-half to Thomas Bardon, Ashland, Wis. Serial No. 338,952.

An apparatus for flushing streets, comprising a metallic pipe, an axle fixed to the middle of the metallic pipe, and wheels mounted on the said axle and arranged at opposite sides of the metallic pipe to support the same above the ground.

PERSONALS

ADAMS, GEORGE G., of Lawrence, Mass., has been selected as the architect for the new City Hall for Montpelier, Vt., and his plans will be changed slightly in accordance with the views of the members of the City Hall Building Committee, so that the cost of the building may be brought within $90,000. Mr. Adams will supervise the construction.

ALLEN, A. B., has been elected Superintendent of Waterworks, of Flemington, N. J.

BARROWS, H. K., Assoc. M. Am. Soc. C. E., District Engineer of the United States Geological Survey for New England and New York, has opened an office at 6 Beacon Street, Boston, Mass., for practice and consultation in civil engineering. Mr. Barrows has had twelve years' experience in municipal engineering with the city of Newton, Mass., in waterworks engineering with the Metropolitan Water Board and in charge of water supply, water power and water storage investigations of the Geological Survey in the East. He will give special attention to water power, water supply and sewerage.

BELL, ALDEN, Mayor of Culpeper, Va., was recently elected to the Legislature of the Old Dominion over D. A. Slaughter, the present incumbent: James Yowell defeated Sheriff A. W. Pulliam for the place, and Russell Smith was reelected Treasurer of Culpeper County.

BENZENBERG, GEORGE, of Milwaukee, Wis., recently spent three days in Kansas City, Mo., going over the waterworks of the city and by direction of the Board of Public Works, S. Y. High, the Superintendent, conducted the engineer and the members of the Board on the inspection tour, which included a trip to the plant at Quindaro.

BRATTON, EDWARD E., has been appointed First Assistant Engineer in the Bureau of Filtration, Philadelphia, Pa.

CROWELL, ALONZO K., has been elected City Engineer of Taunton, Mass.

DALRYMPLE, CHARLES, former Mayor of Albion, Mich., died recently; he had been greatly interested in the advancement of the public school system of the city, having been a member of the Board of Education for thirty-nine years, and resigned two years ago as a protest against what he looked upon as the introduction of fads and whims.

EVANS, ALONZO H., the first Mayor of Everitt, Mass., passed away recently at his home in the Bay State city, aged 71 years.

FLAD, EDWARD, an expert hydraulic engineer, has been appointed by Judge Jacob Fieber, of the Federal Court in Arkansas, to make an inspection of the plant of the Pine Bluff Light and Water Company and decide what improvements are necessary in order that the plant may be made adequate to the needs of the city of Pine Bluff as a result of a suit instituted by the Municipality asking that the charter held by the company be canceled and a receiver appointed, the parties to the controversy having agreed to abide by a decision reached in this manner.

FONDA, FRANK L., has been elected City Clerk of Schenectady, N. Y., to succeed C. O. Dunning, deceased.

FORBES, CHARLES A., has been appointed City Engineer of South St. Paul, Minn.

HERING, RUDOLPH, of New York City, recently paid a visit to Burlington, Vt., with his assistant, Mr. McClintock, and with City Engineer H. M. McIntosh and other members of the Filtration Plant Committee looked over the ground near the pumping station with a view to determining the best location for the proposed filtration plant.

HURLEY, WILLIAM S., President of the Borough Bank, of Brooklyn, N. Y., has been appointed by Mayor George B. McClellan as a member of the Rapid Transit Commission of New York City, to succeed Lewis Cass Ledyard, who resigned several months ago.

KIRMAN, RICHARD, who recently succeeded N. E. Wilson as Mayor of Reno, Nev., announces that he will work for a greater Reno, and has started out by recommending the paving of many streets to the new Council, which consists of R. H. Kinney, Mayor *pro tem.*, and Councilmen John Fitzgerald, Lysle Jamison, Dr. Frank P. Quinn and Robert Nelson.

LYNCH, THOMAS J., Call Engineer of the Fire Department of Holyoke, Mass., and a former Alderman, has been named as City Marshal by Mayor Nathan P. Avery to succeed J. Sydney Wright, who seven weeks ago resigned to become Health Officer.

SHAW, WALTER A., Engineer in Charge of the Bureau of Engineering and the Intercepting Sewers of Chicago, has resigned to enter the field of engineering contracting, and has organized the American Engineering and Contracting Company, which will have its headquarters in Chicago. The firm will do a general contracting and engineering business.

WORREL, M. L., has been elected Superintendent of Waterworks at Selma, Ala.

TILLSON, GEORGE W., New York, Chief Engineer of the Bureau of Highways, Borough of Brooklyn, has been appointed Chief Engineer, Bureau of Highways, Borough of Manhattan.

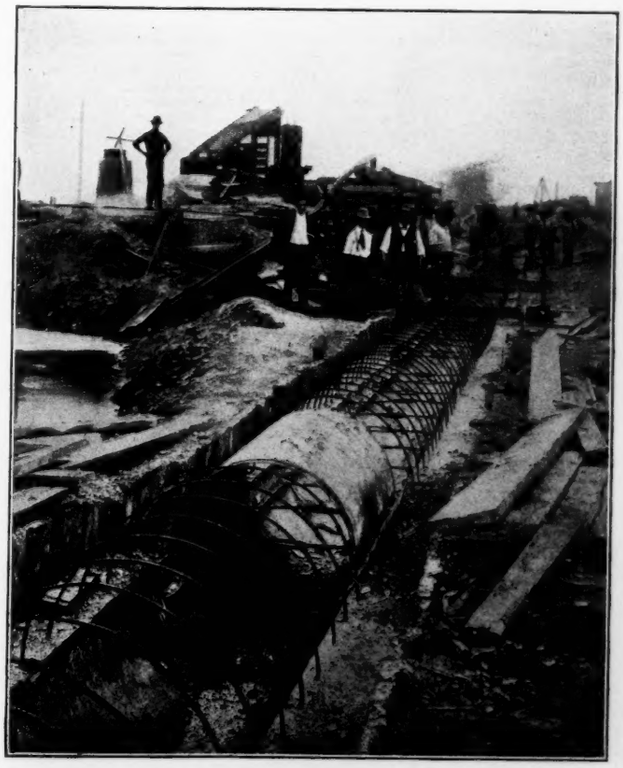
Trade Notes

Contractors' Tools and Machinery.—Harold L. Bond Company, 140 Pearl street, Boston, Mass., issues a complete catalogue of contractors' tools and supplies. These include derricks, winches, derrick fittings, wire rope, chains, tongs, dredging and dumping buckets, pile hammers, Wood rock drills, scrapers, barrows, sand and gravel heaters, portable tar-melting tanks, contractors' carts, road rollers, plows, picks, shovels, Felton's improved couplings for sewer cleaners, also special tools for cleaning sewers, sewer grates, manhole covers, steel pavement cleaners, lead-melting furnaces, ladles, pipe jointers, paving rammers, artificial stone tools, portable forges, blacksmith's tools, pumps, engines, and many other tools for shop and outdoor use.

Structural Steel.—The Minneapolis Steel and Machinery Company issues an artistic booklet telling "what we do." Among other things they make steel water towers and standpipes. The city of Aberdeen, S. D., has one of their Munzel 55 h.p. gas engine producer and pumping plants.

Filtration.—The New York Continental Jewell Filtration Company, Mills Building, 15 Broad street, New York City, is now engaged in installing filter plants at Colon and Panama for the United States Government. Each plant will consist of three Standard New York Horizontal Pressure Filters. The completion of these plants will insure to the Canal Zone a permanent pure water supply.

Steel Centers for Concrete Structures.—The Blaw Collapsible Steel Centering Company, Westinghouse Building, Pittsburg, Pa., manufactures steel forms for concrete sewer and similar work, with a view to the use of the centers over and over again so as to save the expense of wooden forms, besides gaining some incidental advantages in the way of workmanship. The steel centers consist of one or more steel plates of proper dimensions, generally about 1-8 inch thick. The plate in manufacture is passed through heavy rolls, which bend it to the exact shape of the sewer or culvert to be constructed. The steel is kept in shape by reinforcement of angle iron, though a sufficient amount of flexibility is retained to allow the necessary spring for collapsing. Adjacent sections of centers are held together by staples and wedges. When set in position the section is held rigidly to shape by means of turn buckles. Although any desired shape and length of centering can be built up, the sections are usually made five feet long, weigh about 150 pounds, so that two men can handle them. In sizes up to and including five feet in diameter the sections are built in halves. From five to nine feet the sections are furnished in three pieces.



36" REINFORCED CONCRETE SEWER, FLUSHING, N. Y.

THE WEEK'S CONTRACT NEWS

Relating to Municipal and Public Work—Street Improvements—Paving, Road Making, Cleaning and Sprinkling—Sewerage, Water Supply and Public Lighting—Fire Equipment and Supplies—Buildings, Bridges and Street Railways—Sanitation, Garbage and Waste Disposal—Police, Parks and Miscellaneous—Proposals and Awards

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we can not guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also corrections of any errors discovered.

BIDS ASKED FOR

STATE	CITY	RECEIVED UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Street Improvements				
Missouri	Kansas City	June 6, 11 A.M.	Asphalt, 9 sts.; artificial stone walks, 21 sts., etc.	E. A. Harper, City Engineer.
Indiana	Brazil	June 6, 11:30 A.M.	Building 910 ft. gravel road	Clay County Commissioners.
Indiana	Rockville	June 6, 1 P.M.	Constructing gravel roads in 3 twps.	H. A. Henderson, County Auditor.
Indiana	Winchester	June 6, 1 P.M.	Building 6 stone roads, 29,910 ft. long	Mack Pogue, County Auditor.
Wisconsin	Fond Du Lac	June 6, 2 P.M.	Macadam p'vi'g, c'ncr't'e curb and gutter 2 sts.	Board of Public Works.
Missouri	Carterville	June 6	Constructing 140,000 sq. ft. cement sidewalk, 11 streets; cost, $18,000.	H. E. Moody, City Clerk.
Ohio	Portsmouth	June 6	Brick paving, curbing, etc., Young St.	Martin Cook, Bd. Pub. Serv.
Ohio	Cambridge	June 6	Constructing State highway	Sam Huston, Columbus, Com'r.
Ohio	Martins Ferry	June 6	Improving Burling road and other streets	E. D. Lash, Clk. Bd. Pub. Serv.
Ohio	Youngstown	June 6	Paving 4 sts., grading 2; sewers, one	Board of Public Service.
Kansas	Bellevue	June 6	Macadam and comb. curb and gutter on ave.	W. L. Glazier, City Engineer.
New York	Buffalo	June 7, 11 A.M.	Paving 3 streets; repaving one	F. G. Ward, Com'r Pub. Works.
Iowa	Des Moines	June 7, 11 A.M.	Laying 857 ft. Portland cement curb	W. W. Wise, Chm. Bd. Pub. Works.
Ohio	Cincinnati	June 7, noon	Constructing 2,000 ft. road Columbia twp; also five-foot circular concrete culvert on pike	Fred Dreihs, Clk., Co. Com'rs.
Pennsylvania	Williamsport	June 7, noon	Supplying iron approaches for sidewalks, 2 x 2 ft., 1 in. thick, corrugated at both sides, cement, etc	J. J. Galbraith, City Clerk.
Kentucky	Louisville	June 7	Vit. brick paving, 11 streets, cost, $45.000	J. P. Claybrook, City Eng'r.
New Hampshire	Alstead	June 7	Grading and graveling Cady Hill	A. W. Dean, Concord, State Eng.
Illinois	Bloomington	June 7	Brick pavement, concrete curb, State St.	E. H. Packard, Clk. Bd. Pub. Works.
District of Columbia	Washington	June 8, noon	Grading 16th St., extended, N. W.; cost, $28,000	H. B. F. Macfarland, Commissioner.
Indiana	Gary	June 8, 2 P.M.	Improving roadway	C. O. Holmes, Clk. Bd. Trustees.
Maryland	Elkton	June 8	Grading and macadamizing 2 miles of road	C. A. Benjamin, Pres. Co. Com'rs.
Ohio	Celina	June 8	Grading, graveling or macadamizing, 3 roads, 80,000 ft. long, with bridges, culverts, etc.	M. Lutz, Engineer.
Indiana	Jasper	June 8	Constructing road 2 miles long	M. A. Sweeney, County Auditor.
New Jersey	Belvidere	June 10, 11:30 A.M.	Telford macadam road, 28,286 ft. long	Jos. R. Thatcher, Dir. Freeholders.
Arkansas	Lake Village	June 10, noon	Building concrete walk 5 ft. wide, ¼-mile long.	J. C. Gillison, Sec'y Bd. Imp.
Iowa	Cedar Falls	June 10, 7:30 P.M.	Paving 16,000 sq. yds. with brick	C. H. Streeter, City Engineer.
New Jersey	Salem	June 10, 8 P.M.	Grading, oyster shell or gravel, 2.65 miles.	J. F. Ayers, Dir. Freeholders.
Washington	Bellingham	June 10	Paving Prospect st. brick or block; cost, $30,500,	Geo. M. Gerhard, Engineer.
Ohio	Marion	June 11, noon	Constructing sidewalks in six streets	Wm. L. Fies, Clk. Bd. Pub. Serv.
New Jersey	Trenton	June 11	Macadamizing, etc., Lalor St.	Frank J. Eppele, County Engineer.
Ohio	Chardon	June 11	Constructing State highway of macadam	Sam Huston, Columbus, Com'r.
New Jersey	Freehold	June 12, 11 A.M.	Building, repairing, etc., 3 stone roads	George W. Patterson, J. Clk., Freeholders.
Rhode Island	Providence	June 12, noon	Constructing five roads, 89,340 ft. long	State Board of Public Roads.
Maryland	Towson	June 13, noon	Grading and macadamizing ½ mile ave.	E. Stanton Bosley, Sec'y Hwy. Com.
Ohio	Zanesville	June 13	Constructing State highway of brick	Sam Huston, Columbus, Com'r.
Ohio	Caldwell	June 14, noon	Paving four streets with block, 6,900 sq. yds.	H. F. Neuhart, Clk., Bd. Pub. Serv.
Michigan	Alpena	June 14	Laying 4,000 sq. ft. of pavement	William Budde, Comptroller.
Ohio	Cincinnati	June 14	Improving Bank Lick road, culverts, etc.	Fred Dreihs, Clk. Co. Com'rs.
Ohio	Loudonville	June 14	Paving, curb., grad., etc., Main St.	F. L. Niederheiser, Engineer.
Tennessee	Knoxville	June 14	Removing floor of Gay St. Co. bridge; laying steel plate floor; paving roadway bridge and abutments, requiring 250 tons of steel; 2 lots paving, 2,500 sq. yds. each	A. D. Collier, County Judge.
Iowa	Des Moines	June 15, 11 A.M.	Laying 15,298 sq. yds. asphalt Kingman boulevard, 1,860 creo. wood block, Sixth Ave. bridge	W. W. Wise, Chm. Bd. Pub. Works.
Wisconsin	Oshkosh	June 15, noon	Paving three streets with asphalt; new bids.	Board of Public Works.
Ohio	Celina	June 15	Grading, gravel, macadam, etc., Keopple rd.	M. Lutz, County Engineer.
Ohio	Chardon	June 17, 11 A.M.	Grading, draining, etc., Bainbridge road	Grange County Commissioners.
Ohio	Lisbon	June 17, 1 P. M.	Brick paving, grading, etc., two roads	R. G. Boyd, Chm. Co. Com'rs.
Ohio	New Richmond	June 17	Artificial stone and cement walks, 20 streets.	C. T. Rainum, Clk. Bd. Pub. Serv.
Ohio	Cincinnati	June 21, noon	Improving New Richmond Pike	Fred. Dreihs, Clk. Co. Com'rs.
Ohio	Cleveland	June 22, 11 A.M.	Completing Depot Road. Impt., etc.	A. B. Lea., County Engineer.
Pennsylvania	Reynoldsville	June 25, 8 P.M.	Grading, curbing and paving Jackson St.	Clement W. Flynn, Sec'y T'n Coun.
Ohio	Pomeroy	June 25	Laying stone, etc., Storrey's Run road	A. V. Vale, County Auditor.
Indiana	Nappanee	June 26	Paving Main and Market Sts. with brick	John W. Brown, Town Clerk.
Virginia	Norfolk	June 26, noon	Furnishing and constructing asphalt plant	W. T. Brooke, City Engineer.
Wisconsin	Janesville	June 27, 2 P.M.	Macadamizing 2,932 sq. yds.; comb. curb. and gutter, 391 lin. ft. Academy St.	C. V. Kerch, City Engineer.
Water Supply				
Georgia	Madison	June 6, 3:30 P.M.	Constructing waterworks system	E. W. Butler, Mayor.
Michigan	Gladstone	June 6, 5 P.M.	Laying 2,850 ft. 2-in. and 500 ft. 1-in. mains.	W. A. Narracong, Secretary.
District of Columbia	Washington	June 8, noon	Furnishing water meters	H. B. F. Macfarland, Commissioner.
Montana	Dillon	June 8	Constructing concrete-steel reservoir	H. F. Poindexter, City Clerk.
New York	West Point	June 10, noon	Constructing two covered slow sand filters, each one-eighth acre in extent	Quartermaster Military Academy.
South Dakota	Belle Fourche	June 10	Furnishing 11,000 lin. ft. vitrified pipe	U. S. Reclamation Service.
Ohio	Clinton	June 10	Furnishing boilers, pumps, heater valves, hydrants, tank and tower and pipe for complete water works system	O'Neil Engineering Co., Dallas, Tex.
Indiana	Logansport	June 11, 11 A.M.	Constructing James Gault drain, 2 sections	Myers & Yarlott, 212 Fourth St.
Oregon	Portland	June 12, 3 P.M.	Furnishing 105 gate valves, 4-20-in.; 190 sleeves and valves, 4–24-in.; 200 fire hydrants, 40 h. p. Pelton water wheel with plunger pump	D. D. Clarke, Eng'r Water Board.
Ohio	Bellaire	June 12	Improvements at water plant, inc. 6,000,000-gal. vertical pumping engine, pump house, etc.	R. E. Crowe, Clerk of Board.
Iowa	Hampton	June 12	Furnishing material and erecting brick combined electric-light and waterworks bldg.	F. B. Strike, City Clerk.

Water Supply—*Continued*

District of Columbia	Washington	June 15, noon	Furnishing brass stopcocks, lead flange couplings and covers for water meter boxes	H. B. F. Macfarland, Commissioner.
Florida	Fort Dade	June 15	Constructing 150,000-gal. steel tank and trestle, and installing ice and refrigerating plant	Lt. M. H. Barry, Quartermaster.
Ohio	Bellaire	June 17, noon	Furnishing 6,000,000 gal. vertical pumping engine, erecting brick bldg. on concrete	R. E. Crow, Clk., Bd. Pub. Service.
West Virginia	Romney	June 19	Constructing new water and sewer systems, School for Blind, inc. 100-gal. wooden tank on steel trestle, cost, $13,000	William Straus, Clerk of Board.
Wisconsin	West Bend	June 20	Constructing waterworks, inc. c. i. pipe, hydrants, valves, laying pipe, steel tank and tower, gas engine and producer, deep-well triplex pump and power house	W. G. Kirchoffer, Madison, Eng'r.
Ohio	Sandusky	June 20	Mechanical filtration plant, 6,000,000 gals	A. C. Schultz, City Engineer.
New Jersey	Passaic	June 28, 8 P.M.	Furnishing and laying 37 miles, 6 to 20-in pipes, hydrants, etc	Geo. K. Rose, Ch'man Com. on Water Supply.
Ohio	Sandusky	June 29	Constructing 6,000,000-gal. mechanical filtration plant, bidders to furnish plans, etc.; cost, $75,000	B. J. McGory, Clk. Bd. Pub. Serv.
Colorado	Pueblo	June 29	Sale of Compound Condensing crank and flywheel pumping engine, 7,500,000 gals; never used	D. E. Burke, Supt. Waterworks.
North Dakota	Harvey	July 1	Constructing water works, inc. stand-pipe, 18 x 75 ft.; 95 ft. steel tower, 60,000-gal. tank, foundations, c. i. pipe and specials, water gates, hydrants, and water mains	Lykken & Robinson, Grand Forks, Engineers.
Louisiana	Eunice	July 15, 6 P.M.	Constructing waterworks system	Ira W. Sylvester, Alexandria, Contracting Engineer
California	Sacramento	August 19, 8 P.M.	Competitive plans and specifications for constructing filtration plant	M. J. Desmond, Clk. Bd. Trus.

Sewerage

New York	New York	June 6, 11 A.M.	Constructing sewer, etc., Boro Queens	Joseph Bermel, Pres. Boro.
Ohio	Newark	June 6, noon	Laying 10-in. tile sanitary and drain sewer	C. H. Wells, City Engineer.
Georgia	Madison	June 6, 3:30 P.M.	Constructing sewer system, etc	E. W. Butler, Mayor.
West Virginia	Parkersburg	June 6, 8 P.M.	Extension 2-ring brick storm sewer, 6 ft. diam., portions 13th and Ramsey Sts	J. V. Dunbar, City Engineer.
Wisconsin	South Milwaukee	June 6	Constructing complete sewer system	Wm. F. G. O'Neil, City Clerk.
Ohio	Youngstown	June 6	Constructing sewer in McKinnie St	W. H. Millin, Clk., Bd. Pub. Serv.
New York	Buffalo	June 6	Laying 10–20-in. tile sewers, 4 streets	F. G. Ward, Com'r Pub. Works.
Iowa	Des Moines	June 7, 11 A.M.	Constructing 1,488 ft. 10 and 12-in-sewer, 3 sts.; 282 ft. 10-in. sewer, W. 16th St	W. W. Wise, Chm. Bd. Pub. Works.
Ohio	Conneaut	June 7, noon	Laying 2,000 ft. sanitary sewer, etc., 2 streets	T. F. Lininger, City Engineer.
Missouri	St. Louis	June 7, noon	Constructing 2,100 ft. of sewer, 25 ft. wide by 16 ft. 10 in. high, with inlets, manholes, etc	A. J. O'Reilly, Pres. B. P. 1.
Pennsylvania	Williamsport	June 7, noon	Sewer and drain pipe, etc.; also work	J. J. Galbraith, City Clerk.
Ohio	Steubenville	June 7	Constructing sewer in Dock Street	T. W. Vance, Clk., Bd. Pub. Serv.
North Dakota	Fargo	June 7	Trunk sewer, cost, $10,500; lateral, $5,500	S. F. Crabbe, City Engineer.
Ohio	Norwalk	June 8	Laying sewers in two streets	T. B. Kellogg, Clk., Bd. Pub. Serv.
Pennsylvania	McKeesport	June 9, noon	Building Crooked Run and main in Ninth Ward	Thomas W. White, City Engineer.
Texas	Houston	June 10, 3 P.M.	Building receiving tank and sanitary sewers	I. Austin Miller, City Eng.
Pennsylvania	Forest City	June 10, 8 P.M.	Laying 10,500 ft. 8-24-in. terra cotta pipe, etc.	F. J. Howell & Co., Carbondale, Eng.
Ohio	Wauseon	June 10	Laying sanitary sewer from Third St	C. J. Hodges, Clk. Bd. Pub. Serv.
Ohio	Bucyrus	June 10	Erecting sewage disposal plant, inc. laying sewer tile, manholes, concrete filter beds	Chas. Meyer, Clk., Bd. Pub. Serv.
New York	Brooklyn	June 12, 11 A.M.	Constructing relief sewer, Gold St	Bird S. Coler, Boro. Pres.
Ohio	Sandusky	June 14	Reinforced concrete sewer, 2 sts.; cost, $26,000	A. C. Schultz, City Engineer.
Ohio	Loudonville	June 14	Building underground stormsewer, Main St	F. L. Niederhauser, Engineer.
District of Columbia	Washington	June 17, noon	Constructing junction section, trunk sewers	H. B. F. Macfarland, Commissioner.
New Hampshire	Allenstown	June 18, noon	Constructing 6,100 ft. 6–22-in. pipe sewers, 16 manholes and 16 catch-basins	Frank Gay, Manchester, Eng'r.
Illinois	Ottawa	June 18, 2 P.M.	Constructing sewer system, inc. 5,432 ft. monolithic concrete sewer, 2 x 3 ft. egg-shape, to 5 ft. circular; 65,700 ft. 24 to 6-in. pipe 36,000 cu. yds. rock exc., 35,000 ft. sheet piling, 2,350 inlets, 150 manholes, etc	Charles F. Wilson, City Engineer.
Iowa	Ida Grove	June 18, 5 P.M.	Constructing sewer system, inc. 26,000 ft. pipe	Geo. C. Hubbard, City Clerk.

Public Buildings

Kansas	Wichita	June 6, 3 P.M.	Erecting extension to Federal Building	J. K. Taylor, Washington, D. C.
Ohio	Columbus	June 7, noon	Furnishing material for electric wiring, State Capitol, inc. conduit wire, fittings, etc	A. B. Critchfield, Adjt. Gen.
New York	Montgomery	June 8, 9 A.M.	Addition to high school, etc	E. Ross Elliott, Pres. Bd. Educ.
Illinois	Chicago	June 8, 11 A.M.	Two-story and base. brick and stone truck house	John J. Hanberg, Com'r Pub. Works.
Ohio	Struthers	June 8	Erecting brick and stone City Building	L. S. Creed, Clerk of Council.
New York	New York	June 10, 11 A.M.	Repairs, alterations, etc., 30 school bldgs	C. B. J. Snyder, Supt. School B'ld'gs.
Indiana	Indianapolis	June 10, noon	Erecting new school building	School Commissioners.
Connecticut	Bridgeport	June 10	New School building, and con. corridor	Board of Education.
Rhode Island	Newport	June 11, 10 A.M.	Erecting brick hose house, Training Station	Commanding Officer.
North Dakota	Adams	June 11, noon	Erecting 2-story brick school; heating plant	R. L. Smith, Grand Forks, Arch.
Texas	Laredo	June 11	Stone and brick 3-story County Court House	Geo. R. Page, County Clerk.
North Dakota	Hettinger	June 11	Erecting a County building	G. Lansing Hurd, Co. Auditor.
Washington	Tunalip	June 12, 2 P.M.	Erecting dormitory and other buildings	C. M. Buchanan, Supt. Ind. Sch.
Connecticut	Meriden	June 13, 2 P.M.	Building U. S. Post Office	J. K. Taylor, Washington, D. C.
Ohio	Columbus	June 14	Erecting women's dormitory, State Univ	Carl E. Steeb, Sec'y Bd. Trus.
Rhode Island	Wickford	June 15, noon	Erecting brick school house	Wm. R. Walker & Son, Prov'ce, Ac's.
Texas	Fort Sam Houston	June 15	Erecting buildings at post	L. J. Fleming, Q. M., U. S. A.
Indiana	Nashville	June 17, 1 P.M.	Cement and brick veneer school, 6 rooms	School Trustee, Washington T'w'p.
Iowa	Webster City	June 17, 3 P.M.	Constructing U. S. Post Office complete	J. K. Taylor, Washington, D. C.
Oklahoma	Cordell	June 17	Erecting jail; cost, $14,000 to $18,000	Pauly Jail Co., St. Louis, Mo.
Ohio	Mansfield	June 19, 11:30 A.M.	Furnishing hoppers and lavatories for 120 steel cells at Ohio State Reformatory	Fred S. Marquis, Sec'y Bd. Mgrs.
Ohio	Lakewood	June 19, noon	Erecting forge room Manual Training School	L. W. Thomas, Cleveland, Arch.
New Jersey	Bayonne	June 20, 8:30 P.M.	Constructing public school No. 9	Board of Education.
Florida	Fort Dade	June 20	Erecting, wiring, etc., 5 sets of quarters	Capt. M. H. Barry, Q. M., U. S. A.
Indiana	Monticello	June 21, noon	Constructing Poor Asylum for County	White County Commissioners.
Michigan	Adrian	June 25	Erecting new school building	W. Stearns, Secretary Bd. Education.
New York	Ithica	July 1, 3 P.M.	Constructing, complete, U. S. Post Office	J. K. Taylor, Washington, D. C.
California	Redwood City	July 1	Erecting $150,000 Court House for County	Glenn Allen, San Francisco, Arch.
Ohio	Akron	July 1	Erecting 12-room school; cost, $50,000	Harpster & Bliss, Architects.
Texas	San Antonia	July 2, 3 P.M.	Extending, remodeling, etc., Federal Bldg	James Knox Taylor, Wash., D. C.
Texas	Fort Worth	July 8, 3 P.M.	Extending, remodeling, etc., Federal Bldg	James Knox Taylor, Wash., D. C.

Bridges

Kansas	Fort Scott	June 6, noon	Building bridge and 4 stone arch culverts	C. E. Holstein, County Clerk.
Indiana	Crown Point	June 6	Erecting swing bridge at Hammond	Chas. A. Johnson, County Auditor.
Ontario	London	June 6	Erecting eight concrete and steel bridges	Charles Talbot, Co. Engineer.
Ohio	Zanesville	June 6	Stone substructure, bridge over creek	L. E. Brelsford, County Auditor.

Bridges—*Continued*

Pennsylvania	Reading	June 7, 10 A.M.	Erecting 2 reinforced concrete arch bridges, one 36 ft. clear span and wing walls.	H. F. Livingoud, Co. Comptroller.
Ohio	Cincinnati	June 7	Constructing 5-ft. circ. concrete culvert and repairing 8-mile bridge	Fred. Dreihs, Clk. Co. Comrs.
Mississippi	Tunica	June 7	Building bridge 75 ft.; also 250 ft. long	G. F. L. Hope, Clk. Bd. Supervisors.
Ohio	Cleveland	June 8, 11 A.M.	Erecting concrete abutments; also steel bridge concrete floor, Brecksville twp.	A. B. Lea, County Surveyor.
West Virginia	Parkersburg	June 10, noon	Steel superstructure, 808 ft. long, inc. 300-ft. span, two 120-ft. spans, 5 girder spans, 53 ft. long	C. H. Shattuck, Pres. Bridge Co.
Ohio	Wooster	June 10	Erecting iron span bridge, concrete floor	Henry M. Knepp, County Engineer.
Ohio	Hamilton	June 11, 10 A.M.	Erecting bridge, Reilly twp., of concrete or according to plans of bidders.	Chris. Pabst, County Auditor.
Ohio	Marietta	June 11, noon	Erecting new bridge; also building superstructures and repairing substructures 5 bridges	J. M. Williams, County Auditor.
Tennessee	Knoxville	June 14, 10 A.M.	Steel plate floor Gay St. bridge, etc.	L. C. Carter, Burlington, N. C. Bridge Engineer.
Ohio	Cincinnati	June 14, noon	Repairing abutments, 2 bridges; also 2 culverts	Fred Dreihs, Clk. Co. Com'rs.
District of Columbia	Washington	June 15, noon	Concrete-steel bridge over R. R. in Anacostia; span 17 ft.; contain 34 tons steel, 1,000 cu. yds. concrete	H. B. F. Macfarland, Commissioner.
Ohio	Celina	June 15	Constructing bridges and culverts, Keopple road	M. Lutz, County Engineer.
Ohio	Jeffe son	June 17, 1 P.M.	Constructing stone or concrete abutment	P. C. Remick, County Audito .
Indiana	Rushville	June 17	Constructing 7 and repairing 2 bridges	Rush County Commissioners.
Ohio	Cincinnati	June 17	Building 2 culverts; repairing 2 abutments and arch culvert, removing iron superstructure, etc.	Fred Dreihs, Clk. Co. Comm'rs.
Missouri	Brunswick	June 18	Erecting steel bridge, 700 ft. long	O. G. Dameron, Keytesville, Co. Sur.
Ohio	Greenville	June 20, noon	Erecting steel or reinforced concrete bridge	Chas. S. Slade, City Engineer.
Michigan	Grand Rapids	June 20, 8 P.M.	Erecting superstructure, steel bridge; four 150-ft. spans, roadway and 2 sidewalks	L. W. Anderson, City Engineer.
Tennessee	Natl. Soldiers' Home	June 25	Building concrete bridge over Brush Creek	Treasurer of Home.
Nebraska	Mitchell	June 26, 2 P.M.	Erecting wooden, steel and concrete bridges; regr. 11,000 cu. yds. concrete, and furnishing 450,000 lbs. structural and reinforcing steel; 66,000 lbs. c. i. head gates and operating devices.	U. S. Reclamation Service.
New Brunswick	Fredericton	July 8	Constructing two spans each 252 2-3 ft. long.	C. H. L. Labillois, Com'r Pub. Works.
Ontario	Toronto	July 16, noon	Supplying and erecting steel ry. bridges and hand-railing, Lansdowne Ave. subway	C. H. Rust, City Engineer.

Miscellaneous

Alabama	Dora	June 6, noon	Erecting complete with machinery, etc., municipal electric light plant	Thornton Co., Birmingham, Eng'rs.
Georgia	Madison	June 6, 3:30 P.M.	Improving electric light plant, etc.	E. W. Butler, Mayor.
Georgia	Macon	June 6	Constructing municipal lighting plant	T. W. Wilcox, City Engineer.
New York	New York	June 7, 10:30 A.M.	Furnishing 5,000 ft. 2½-in. rubber fire hose for volunteer companies	Francis J. Lantry, Fire Comm'r.
Pennsylvania	Williamsport	June 7, noon	Plumbing, tin work, etc., for city	J. J. Galbraith, City Clerk.
Rhode Island	Fort Adams	June 10, 10 A.M.	Erecting steel smoke stack for power plant	Capt. Willis G. Metcalf, Q. M.
Massachusetts	Boston	June 10, 3 P.M.	Seven high-pressure steam boilers, etc.	J. K. Taylor, Washington, D. C.
Florida	Key West	June 11, 10 A.M.	Furnishing concrete mixer at Naval Station	Bur. Sup. and Accts. Navy Dept., Washington, D. C.
Georgia	Macon	June 11	Furnishing light and water until completion of municipal plant being planned	J. W. Wilcox, City Engineer.
Washington	Tunalip	June 12, 2 P.M.	Power house, electric-light plant, etc.	C. M. Buchanan, Supt. Ind. School.
Indiana	Fort Wayne	June 12	Building $160,000 electric-light plant; two 300 kw. turbine units or 3 250 kw. engine, type a. c. generators; 420 arc lamps	Owen Ford, St. Louis, Mo., Eng'r.
Iowa	Hampton	June 12	Erecting electric light and water station	F. B. Strike, City Clerk.
New York	New York	June 13, noon	Building subway Route No. 9, Delancey St.	Rapid Transit Commissioners.
New York	Brooklyn	June 13, 3 P.M.	Furnishing 4 street sweepers and road scraper; erecting 3-rail pipe fence, Greenpoint Park	Moses Herrman, Park Board.
Pennsylvania	Philadelphia	June 14, 1 P.M.	Furnishing 350 kw. engine or turbine, etc.	Col. Frank Heath, Frankford Arsenal.
Georgia	Macon	June 14, 3 P.M.	Electric pass. elevator U. S. C. H. addit'n	J. K. Taylor, Washington, D. C.
California	Los Angeles	June 14	Delivery 30,000 bbls. Portland cement in 60 days, 1,250,000 bbls. in 12 months.	H. B. Ferris, Sec'y Bd. Pub. Works.
California	Sausalito	June 14	Erecting electric system, furnishing current for lighting, etc., Forts Baker and Barry	Capt. B. F. Cheatham, Q. M., U. S. A.
Tennessee	Chattanooga	June 15, noon	Constructing highway tunnel 700 ft. long under Mission Ridge.	W. L. Dodds, County Engineer.
Florida	Fort Dade	June 15, 8 P.M.	Constructing 150,000 gal. steel tank and trestle and installing ice and refrig. plant.	Lt. M. H. Barry, Quartermaster.
Georgia	Elberton	July 15	Constructing electric power plant, operated by steam, 108 kw. alternator and exciter, 150 h.p. engine	G. W. Hubbard, Superintendent
Indiana	Fort Wayne	June 24, 3 P.M.	Erecting new municipal lighting plant	Edward J. Lennon, Pres. B. P. W.
Ohio	Youngstown	June 29, 5 P.M.	Collection, removal, disposal garbage, 5 yrs.	Clate A. Smith, Sec'y Bd Health.

STREET IMPROVEMENTS

East Lake, Ala.—Bids are being received for the purchase of $100,000 5 per cent. 10-year street improvement bonds.

Little Rock, Ark.—Asphalt will be used in paving the general downtown district now in process of formation, east and west of Louisiana street to Fifteenth street, and Louisiana street to Twenty-fifth street; probable cost of work, $200,000.—E. A. Kingsley, City Engineer.

Colorado Springs, Col.—The business men have petitioned for paving certain streets.

Bridgeport, Conn.—The City Engineer has been instructed to secure figures for wooden block pavement for the draw of the East Washington avenue bridge.—M. L. Reynolds, Mayor.

Elberton, Ga.—The town will advertise within thirty days for bids on about 10,000 to 15,000 square yards of vitrified brick paving.—H. S. Jaudon, Thomasville, Ga., Engineer.

Morton, Ill.—Jacob A. Harmon, of Peoria, is preparing estimates for paving certain streets.

Springfield, Ill.—Council is arranging to pave additional streets.

Topeka, Kan.—John Rogers, City Engineer, recommends that the new paving be laid on concrete foundation.

Louisville, Ky.—The Board of Public Works is preparing estimates for asphalt pavements on Dellwood avenue, vitrified brick pavements on Clark street, and for the pavement of a large number of alleys; bids will also be advertised for eleven brick sidewalks in the East End.

Lowell, Mass.—The City Engineer has been instructed to prepare plans and estimates for paving Central street from Merrimack street to Towers Corners, with granite block on concrete base, and a cement top.

Benton Harbor, Mich.—The paving of West Main street is contemplated.

Croswell, Mich.—About $18,000 is to be expended in street improvements.

Eaton Rapids, Mich.—An election will be held to vote on the question of issuing $15,000 paving bonds.

Grand Rapids, Mich.—Bids will be received, June 20, 4 p.m., for $255,000 coupon bonds for street improvements.—John L. Boer, City Clerk.

Jackson, Mich.—The city will pave about one mile of East Main street and one-half mile on West Main street this year.—A. W. Hall, City Engineer.

Vicksburg, Miss.—Council has passed resolutions to pave Washington street, from Harris street to the city limits, about three-eighths mile, and to lay about three-fourths mile of sidewalks on same street; a petition to pave Walnut has been filed and will be acted upon at once.—B. W. Griffith, Mayor.

St. Joseph, Mo.—The Board of Public Works has directed plans to be prepared for paving certain streets.

Redlodge, Mont.—Council has authorized an issue of $3,000 bonds for sidewalks.—T. R. Austin, Mayor.

Omaha, Neb.—Council has under consideration the paving of additional streets; estimated cost, $130,000.

York, Neb.—Harris & Company have purchased $15,000 paving bonds, at a premium of $400.

Wilson, N. C.—Bids will be received, June 15, for the purchase of $100,000 5 per cent. 30-year road bonds.

Akron, O.—Council has passed an ordinance providing for an issue of $6,000 bonds for the extension of Bittman street.

Blackstone, O.—The Board of Supervisors have decided that a bond issue for macadamizing several streets must be authorized.

Fremont, O.—Council has been asked by the residents of Lincoln street to have the thoroughfare paved; resolutions to pave White avenue have passed their final reading, and plans will be prepared for this improvement.

Hamilton, O.—High street is to be paved its full width, 44 feet, and plans will be immediately prepared and bids invited; the material has not been determined upon; the County Commissioners have made their final plans for straightening and improving Crawford road; estimated cost, $65,000.

Lima, O.—Plans are being prepared in the Engineering Department for the paving of a large number of streets, many of which are to be of cement construction.

Logan, O.—The County Commissioners are about to authorize the preparation of specifications for the construction of several miles of road in this county.

Lorain, O.—A $20,000 bond issue for paving Everett street has been authorized, and a bond issue for paving Washington and Bank streets has been recommended; Council will proceed at once with the improvement of Vine street by paving with asphalt or brick.

New Bremen, O.—Council has adopted plans and specifications for sewer system; Engineer Fishbaugh will also shortly complete plans and profiles for street paving.

Oberlin, O.—Council has decided to issue $38,000 paving bonds for improvements this season.

Sandusky, O.—The estimate for paving Washington street, now in the hands of the Board of Public Service, calls for $35,000 for sheet asphalt, $32,000 for block, and $31,500 for brick or bitulithic.

Springfield, O.—The village of Charleston has decided to issue $5,500 bonds for paving a number of streets of the village.—S. L. Tattum, City Solicitor.

Guthrie, Okla.—Council has received petition for paving certain streets.

Altoona, Pa.—Mayor Walker has signed ordinances providing for a new loan of $100,000 to pay for the city's share of paving ten more miles of streets.

Chester, Pa.—Council is negotiating a loan of $200,000 for street and sewer improvements.

Salt Lake City, Utah.—Estimates are being prepared for paving certain portions of South West street; estimated cost, $160,000.

Rutland, Vt.—The Town Board is considering specifications for paving certain streets with brick.

Seattle, Wash.—The Board of Public Works has rejected bids received for paving the Queen Anne Hill District; bids will soon be received.

Moorefield, W. Va.—Monroe county is about to issue $100,000 bonds for building macadamized roads.

Fond du Lac, Wis.—Council is arranging to pave additional streets.

Racine, Wis.—Estimates are being prepared for paving many streets.

SEWERAGE

Birmingham, Ala.—An ordinance has been introduced in Council looking to the calling of an election, to vote $500,000 bonds for general storm sewer improvements.

Ensley, Ala.—The citizens have voted to issue $55,000 bonds for storm and sanitary sewers.

Jasper, Ala.—A sanitary and storm sewer system, to cost $15,000, will probably be built.

Woodlawn, Ala.—The citizens have voted $15,000 sewer bonds, $20,000 street bonds and $12,000 for a City Hall.

Fort Smith, Ark.—Bids will be received, June 20, for the purchase of $550,000 Sewer District No. 2 bonds and $750,000 District No. 5 bonds.

Alton, Ill.—The question of constructing a trunk sewer to drain upper Middletown, to cost about $100,000, is reported under consideration.—Mayor Beall.

Pekin, Ill.—Bids will probably be called for about July 1 for brick and pipe sewers, to cost about $115,000.—John R. Siebert, City Engineer.

Peoria, Ill.—Bids have not yet been asked for the proposed East Bluff sewer; it will be constructed of brick, and cost $233,000.—C. M. Dolan, City Engineer; E. A. Furry, Commissioner of Public Works.

Columbus, Ind.—The preliminary resolutions for the building of the Mechanic street sewer, which will cost $15,000, have passed Council.

Greenfield, Ind.—Bids are invited for the construction of sewers in North and Sixth streets.—Oscar O. Beaver, City Clerk.

Indianapolis, Ind.—Bids will soon be asked by the Board of Public Works for constructing sewer 9,855 feet in length in Missouri street.—Blaine H. Miller, City Engineer.

Brockton, Mass.—This city will probably build about four miles of pipe sewers by day labor; also six new filter beds for intermittent filtration.—Chas. R. Felton, City Engineer.

Iron River, Mich.—The Village Council is considering the question of constructing sewers.—Chas. A. Otto, Village Clerk.

Duluth, Minn.—A petition has been presented to the Board of Public Works for a large sewer on Minnesota avenue; the City Engineer has completed plans for the Garfield avenue sanitary sewer, which will cost about $9,410.

Everett, Mich.—The village has authorized an issue of $40,000 bonds for sewers.

Springfield, Mo.—An ordinance is before Council providing for the construction of sewers in District No. 63.—G. P. W. Wackley, City Clerk.

Verona, N. J.—The Board of Health has approved plans for a sewage disposal plant to be erected at the Newark City Home.

Asbury Park, N. J.—The citizens have voted to issue $75,000 bonds for sewers.

Carlsbad, N. M.—The Town Board has authorized City Engineer to prepare plans for a sewerage system.

Auburn, N. Y.—Mayor Aiken has approved resolution providing for a $30,000 disposal plant in connection with the proposed Fourth, Fifth, Sixth and Seventh Ward sewer.

Fargo, N. D.—Arrangements are being made to build sewers in certain streets; estimated cost, $16,000.

Akron, O.—Council has decided to construct a sewer in Croesier street, which will be about 1,000 feet long; it will be an 8-inch structure.

Circleville, O.—Council has asked F. A. Peas, of Cleveland, to make a preliminary examination as to the estimates and necessities of a sewer system for the village; the town will probably eventually order the construction of such a system.—J. F. Crimmins, Director of Public Service.

Columbus, O.—Council has passed an ordinance appropriating $40,000 for the construction of a 20-inch force main for the East Side sewage pumping station.

Dayton, O.—The Clerk is about to advertise for bids for constructing a sanitary sewer in Districts No. 4 and No. 6.

Delphos, O.—Council has passed ordinances providing for the construction of a $10,000 sewer.

Eaton, O.—Council has finally passed the ordinance declaring it necessary to construct a system of storm and sanitary sewers; the State Board of Health has approved, with some modifications, the plans which have been prepared.

Jackson, O.—Council will expend about $4,400 in some sewer improvements, plans and estimates for which have been accepted from Engineers Riggs and Sherman, of Toledo.

Rockland, O.—Some changes are to be made in the original plans for sewers in this town; City Clerk Rolef has been instructed to advertise for bids for furnishing the city with water for ten years.

Logan, O.—The residents of Riverdale, through Homer Hensel, have asked Council for a sewer for that part of the city; Mayor Dollison states that the Council will secure estimates on the construction of the system.

Orrville, O.—An election will be held, June 11, on the question of issuing $5,000 bonds for the construction of a sewage disposal plant and sewerage system.

Upper Sandusky, O.—The matter of the construction of the sewer system, the estimated cost of which is $80,000, has been referred to the Street Committee.—Jacob Green, Engineer.

Urbana, O.—The Board of Public Service is seeking a suitable place for the location of a sewage disposal plant for this town.

Warren, O.—W. T. Smith has been awarded contract for the Youngstown avenue sewer.

Hobart, Okla.—Bonds, $25,000, have been authorized for sewers.

Baden, Pa.—The proposed sewerage system will cost about $20,000.—J. P. Leaf, Rochester, Pa., Engineer.

Huntingdon, Pa.—J. Murray Africa, Borough Engineer, is preparing plans for sewers, to cost about $11,000.

Wilkes-Barre, Pa.—Mayor Kirkendall is in favor of issuing $40,000 bonds for sewer in outlying districts, $25,000 for the new East End bridge and $35,000 for a new station house.

New Wilmington, Pa.—Geo. Zahnizer, of New Castle, is preparing plans for a sewerage system, to cost about $10,000.

Sunnyside, Wash.—An election will be held to decide the question of issuing $8,000 sewerage bonds.

Bluefield, W. Va.—E. E. Carter, Mayor, has issued a proclamation for a bond election calling for the issue of $100,000 worth of bonds for improving and extending streets and for completing the sewerage system.

Lakemills, Wis.—Plans and specifications are being prepared by W. G. Kirchoffer, Madison, for constructing sewerage system and disposal plant; bids will probably be received in July or August.

North Milwaukee, Wis.—Plans and specifications for constructing sewerage system and disposal plant are being prepared by W. G. Kirchoffer, Madison; bids will probably be received in July or August.

WATER SUPPLY

Tuscaloosa, Ala.—Bonds, $125,000, will be issued by the city to extend the recently-acquired water plant.

Colorado Springs, Col.—A company has been organized with a capital of $7,000,000 for developing water power for manufacturing purposes; the principal office will be in Colorado Springs.—Myron T. Herrick, of Cleveland, is at the head of the movement.

Denver, Col.—Council has passed an ordinance ordering the Union Water Company to extend its mains along State street and set two fire hydrants.—E. H. Sommers, City Clerk.

Hartford, Conn.—New mains will be laid on Martin and Tremont streets, and a 1,000-foot extension on Franklin avenue.

Meriden, Conn.—Preliminary steps are being taken for the construction of a reservoir, but the work will not be done immediately.—W. S. Clark, City Engineer.

Augusta, Ga.—The city contemplates increasing water supply by constructing additional reservoir and pipe line from basins to city.—W. E. Getshell, City Engineer.

Cochran, Ga.—Bids will be received, June 11, for the purchase of $15,000 6 per cent. 5 to 30-year waterworks bonds.—J. C. Urquhart, Clerk.

Pavo, Ga.—The city proposes to issue bonds for waterworks and schools.

Covington, Ga.—Council has decided to call an election to vote $50,000 bonds to construct waterworks and for other civic improvements, and the successful outcome of the election is almost a certainty.

Pelham, Ga.—Bids for the purchase of $35,000 electric-light and water bonds have been rejected; new bids will be received.

Berwyn, Ill.—The city is considering a direct water supply for North Berwyn from Chicago or Cicero.

Chicago, Ill.—The proposed high-pressure water system for fire protection in the downtown district is favored by Mayor Busse.

Eufaula, I. T.—Bonds, $55,000, have been voted for water supply.—J. W. Thornton, Secretary.

Rome, Ia.—Council has been petitioned to lay water mains in seven streets.—Address Mayor Farrow.

Green Cove Springs, Fla.—A waterworks system will be installed by A. A. Kind, of Jacksonville.

Eldora, Ia.—Council has voted to install new pumping machinery at the waterworks station.

Topeka, Kan.—The matter of water meters is again being agitated by the City Council.

Quincy, Mass.—Council has appropriated $30,000 for extending water mains.—Address Mayor Thompson.

Benton Harbor, Mich.—Council proposes to appropriate $5,000 for sinking additional wells.

Evart, Mich.—The Legislature has authorized the village to issue $40,000 bonds for constructing water system.

Ishpeming, Mich.—The Board of Public Works is looking for prices on 12,000 feet of 14-inch pipe; estimated cost, $25,000; bonds, $40,000, will probably be issued for improvements.

South Range, Mich.—Bond for $19,000 for waterworks will be issued.

Union City, Mich.—The waterworks system is being improved.—James Wetmore, City Engineer.

Aurora, Minn.—Plans have been prepared for a waterworks.—C. A. Vanderpool.

Duluth, Minn.—The city will lay larger mains on Garfield avenue.

Sauk Rapids, Minn.—The question of issuing $17,000 bonds for water supply will be submitted to a vote of the people.

Gulfport, Miss.—Council proposes to issue $150,000 paving and water bonds.

Centralia, Mo.—Work will soon commence on the construction of a $100,000 water system.

North Coshocton, N. Y.—Council has appointed a committee to look after the matter of securing water for fire protection.

Rockingham, N. C.—The city will install waterworks and sewerage systems, for which bonds amounting to $40,000 have been voted.—W. N. Everett, Mayor; T. C. Leak, Chairman, Finance Committee; Wm. Entwistle, Chairman, Waterworks Committee.

Akron, O.—The water mains will probably soon be extended on Payne and Newberry streets.—J. W. Payne, City C. E.

Cuyahoga Falls, O.—The Water Board is arranging to extend water mains to outlying districts.

Portsmouth, O.—A sand filtration system will be adopted.

Youngstown, O.—The Board of Public Service recommends an issue of $30,000 bonds to provide for water main.

Hobart, Okla.—The citizens have voted $15,000 waterworks bonds.

Lawton, Okla.—Fire destroyed the pumping plant of the waterworks.

Asheville, N. C.—An increase in the supply through gravity line is proposed.—B. M. Lee, City Engineer.

Rockingham, N. C.—Water and sewerage bond of $40,000 will be voted on.—W. N. Everett, Mayor.

Marion Heights, Pa.—Municipal waterworks will be established.

Seneca, S. C.—Bonds, $25,000, have been voted for light and water plant.

Denison, Tex.—Council has taken steps towards securing municipal waterworks.

Temple, Tex.—Council has under consideration the establishment of a municipal water plant; the city may purchase the present plant or contract for a new one.

Victoria, Tex.—A petition is being circulated for an election on the question of establishing municipal artesian waterworks.

Swanton, Vt.—At a special village meeting it was voted to get a water supply from Fairfield pond, at a cost not to exceed $75,000; a special committee was appointed to act with the President of the Village and the Board of Trustees in the construction of the pipe line and reservoir; the committee was composed as follows: A. G. Webster, Byron H. Jewett, E. J. Ranslow.

Harrington, Wash.—The proposition to issue $22,000 additional waterworks bonds carried.

Port Townsend, Wash.—Council is arranging to improve the waterworks.

Elkins, W. Va.—The Street Committee has under consideration the petition for the extension of the water system for fire protection into the Hinkle addition.

Gays Mills, Wis.—Bids will soon be received for constructing waterworks; estimated cost, $10,000.—W. G. Kirchoffer, Madison, Engineer.

Viola, Wis.—Bids will soon be received for constructing waterworks; estimated cost, $10,000.—W. G. Kirchoffer, Madison, Engineer.

Wheatland, Wyo.—The town has voted for a municipal waterworks.—M. K. Johnson, Mayor.

Carman, Man., Can.—An election will be held, June 11, to decide the question of issuing $16,000 waterworks bonds.

North Battleford, Man., Can.—The sum of $100,000 will be spent on waterworks, sewerage and electric-light plant.

Niagara Falls, Ont., Can.—Waterworks improvements costing $35,000 will be carried out.—W. J. Seymour, City Clerk.

Albany, Que., Can.—Hydrants for fire protection will be installed.

LIGHTING AND ELECTRICITY

Bloomington, Ill.—Council will soon let contracts for remodeling the electric light plant; plans and specifications will be published within a short time and bids will be asked for on the basis of such plans.

Freeport, Ill.—Charles E. Gregory has filed with the Secretary of the State an application for papers of incorporation for his new lighting enterprise; the gas and electric branches of the business will be united in one company, to be known as the Stephenson County Lighting and Power Company.

Peoria, Ill.—Within a few weeks the Peoria Gas & Electric Company will begin work which will result in the expenditure this season of not less than $300,000; plans and specifications for the new underground conduit system will be received in a few days, and as soon as the contracts have been allowed the work will begin—Emil G. Schmidt, Manager.

Clay City, Ind.—The boiler in the Clay City electric plant exploded and the entire plant was wrecked causing a loss of $25,000; improvements will probably be made at once.

Muncie, Ind.—The Municipal Electric Light Company has purchased a site for erecting a new power house.

Sallisaw, I. T.—Council has passed an ordinance granting an electric light franchise to Cuddy and Ripple at Paris, Ark., who expect to install a plant and turn the light on the city by September.

Topeka, Kan.—Topeka voters will be given the opportunity to vote bonds to the amount of $65,000 to pay for the reconstruction of the present city lighting plant. If the bonds are defeated, Council will probably make a contract with the Topeka Edison Company for lighting the city.

Franklin, La.—Council has adopted plans for a municipal lighting plant; estimated cost $30,000.—C. Laude, Superintendent.

Haverhill, Mass.—A proposition for the establishment of a municipal lighting plant is the challenge which Council is now making to the lighting companies of the city pending the settlement of the terms of a contract for the lighting of the streets.—Roswell L. Wood, Mayor.

Detroit, Mich.—The Michigan Power Company will increase the efficiency of the Piatt Dam power plant from 800-horsepower to 2,000 during the summer.——W. H. Simmerman, Superintendent.

Laurel, Miss.—The Gulf States Company, which owns the electric light plant in this city has applied to Council for a street franchise; a franchise has also been asked by Frank Gardner and a number of others.

Centralia, Mo.—The Mercantile Trust Company of St. Louis has purchased $130,000 light and water bonds at a premium of $10.50 on the thousand.

Jackson, Mo.—Bids will probably be received about July 1 for the proposed electric light plant and waterworks pumping station, for which Hiram Phillips, of St. Louis, is preparing plans; probable cost, $35,000.—G. W. Vinyard, Chairman, Committee.

Kansas City, Mo.—The Union Gas and Traction Company has been incorporated with a capital stock of $5,000, by C. H. Pattison, B. J. Mattocks and others.

Cortland, N. Y.—The Cortland County Traction Company has been authorized to issue a first and refunding mortgage for $2,000,000 and to increase its capital stock from $320,000 to $1,000,000; the proceeds of the new securities are to go for the retiring of outstanding bonds, the discharging of a floating indebtedness and the construction of 23 miles of double track road to Syracuse and two miles in Cortland.

Charlotte, N. C.—The Bradshaw Electric Company has been incorporated with a capital stock of $50,000, by C. E. Bradshaw, Oliver Holmes and others.

Greensboro, N. C.—W. T. Van Brunt and associates have purchased the Greensboro Electric Company's plant; the plant is to connect Greensboro and High Point with an electric rail.

Lakewood, O.—The plant of the Lakewood Municipal Lighting Company has been damaged by fire.

Big Run, Pa.—The Big Run Heat & Power Company has been incorporated.

Scranton, Pa.—The Scranton Electric Light and Heating Company has accepted plans for new power house; the capacity of the plant will be doubled.—A. J. Duffey, Chairman.

Henderson, Tenn.—The city has voted $20,000 electric-light bonds.

Blooming Grove, Tex.—The Home Light, Water and Ice Company has been incorporated with a capital stock of $30,000.

Brownsville, Tex.—A franchise for supplying the city with gas for fuel and lighting purpose will be asked of Council; the project belongs to C. S. Longenecker of Chicago, Ill.

Richmond, Va.—The finance committee of Council has recommended a bond issue of $350,000 for constructing an electric-lighting plant and $310,000 for reconstructing the gas works.

Milwaukee, Wis.—Decision to advertise for bids for a gas producer and engine for a municipal electric-light plant was made by advisory Board of Aldermen and Board of Public Works; three sets of specifications will be used, and if sufficient power can be furnished by manufacturers of gas engines, it is believed that this kind will be purchased; the cost will be about $40,000.

Superior, Wis.—Owen Ford of St. Louis has completed plans for the municipal lighting plant to be erected at Superior.

FIRE EQUIPMENT

Roseville, Cal.—Council is arranging to establish a Fire Department.

Greenville, Conn.—Arrangements are being made to build an engine house.

Newport, Del.—A new hose company has been organized.—C. W. King, President.

Coeur D' Alene, Ida.—The matter of issuing bonds for the construction of a fire hall is under consideration.

Galesburg, Ill.—Council has decided to build a fire station.—H. B. Huff, City Clerk.

Huntsville, Ind.—Council has decided to improve the city fire protection.

Muscatine, Ia.—Plans have been prepared and accepted for building a brick hose house.

Mineral, Kan.—Council has under advisement the purchase of hose cart.

Topeka, Kan.—The residents of the sixth precinct have petitioned for a fire station.

Duluth, Minn.—The residents of Park Point have petitioned for additional fire apparatus.

East Grand Forks, Minn.—Council is arranging to build a fire hall.

Kansas City, Mo.—The Board of Public Works has been notified by the Fire Chief that 10,000 additional feet of hose is required, also hook and ladder truck for Company No. 17 engine house. Bids will soon be asked for.

St. Louis, Mo.—The Fire Chief has petitioned for two fire engines and one combination chemical wagon.

Trenton, N. J.—The Board of Fire Commissioners have organized fire company No. 7.

Syracuse, N. Y.—The Kyne Hose Company of East Syracuse is raising money for the purchase of uniforms.

Fort Worth, Tex.—The Fire and Police Committee has decided to build an additional fire house.

Bellows Falls, Vt.—The Village Board proposes to purchase chemical hose wagon.

PUBLIC BUILDINGS

Birmingham, Ala.—The citizens of Jefferson county will vote, June 24 on the question of issuing $500,000 4 1-2 per cent, jail bonds.

Tuscumbia, Ala.—Probate Judge Simpson has been authorized to secure plans and specifications to be submitted by June 10 for a jail, the cost not to exceed $15,000.

Redlands, Cal.—The citizens will vote on the question of issuing $20,000 bonds for school purposes.

San Diego, Cal.—The School Board has petitioned for a bond issue of $150,000 for school purposes.

Santa Barbara, Cal.—An election will be held to vote on the question of issuing $10,000 bonds for the erection of school.—M. B. McDuffy, Clerk of the Board.

Miami, Fla.—An election will be held, June 8, to decide the question of issuing $40,000 5 per cent. District No. 1 school bonds.

Brunswick, Ga.—Another election will be held to decide the question of issuing $75,000 Court House and jail bonds.

Carthage, Ill.—Bids will be received June 7 for the purchase of $125,000 5 per cent. Court House bonds.—Jas. W. Westfall, County Auditor.

Morris, Ill.—The citizens have voted $8,000 bonds for school purposes.

Escanaba, Mich.—The Delta County Board has directed bids to be received for the purchase of $8,000 almshouse bonds.

Rochester, Mich.—Bonds, $6,000, have been voted for school purposes.

Potosi, Mo.—Washington County has voted $30,000 Court House bonds.

Red Cloud, Neb.—The proposition of voting Webster County Court House bonds has been defeated.

Franklin, N. Y.—An election will be held June 7 to vote on the question of issuing $20,000 school bonds.

Syracuse, N. Y.—Architect Archimedes Russell is preparing plans and estimates for remodeling the County Clerk's office to make it suitable as headquarters for the Bureau of Police.—R. S. Bowen, Commissioner of Public Safety.

Lumberton, N. C.—The proposition to issue $25,000 school bonds carried.

Grand Forks, N. D.—Council Committee has decided to build a City Hall and fire station, estimated to cost $14,000.

Cincinnati, O.—The Board of Public Works has asked for bond issue of $75,000 for hospital repairs.

Cridersville, O.—The proposition to issue $50,000 school bonds carried.

Sumter, S. C.—Bids will be received, July 1, for the purchase of $30,000 4 1-2 per cent. 20-year school bonds.

Kennedy, Tex.—The city has voted $12,000 5 per cent., 40-year school bonds.

Montpelier, Vt.—A new City Hall to cost $90,000 or $95,000, with an auditorium, having a seating capacity of 1,500 or 1,800 is to be built; the Building Committee has selected George G. Adams, of Lawrence, Mass., as Architect.

Portsmouth, Va.—The Legislature will be petitioned to increase the amount authorized for a new City Hall from $50,000 to $150,000; the Finance Committee will arrange preliminaries.—Samuel T. Montague, Board of Aldermen.

Wheeling, W. Va.—An election will be held July 16, to vote on the question of issuing $200,000 4 1-2 per cent. school bonds.

STREET RAILWAYS

Nauvoo, Ill.—The Mississippi Valley Railway Company will let contract shortly for grading 45 miles of electric road; the company is also in the market for poles and railway equipment.

Springfield, Ill.—The Springfield Belt Railway Company has increased its capital stock from $5,000 to $500,000; the purpose of the corporation is to build a line from Lincoln to Jacksonville and to belt this city.—George E. Mathias, B. E. Bramble, Charles Zetly, and others, incorporators.

Indianapolis, Ind.—The Terre Haute & Merrom Traction Company of Terre Haute, Ind., has been incorporated with a capital stock of $250,000 by Frank L. Lewis, Virgil Pounds, J. F. Roebuck and a number of others.

Seymour, Ind.—Seymour & Brownstown Interurban Motor Line Railway Company has been incorporated with a capital stock of $10,000, by J. I. Serceney, N. I. Miller and others.

Portland, Me.—It is expected that work will begin at once on the construction of an electric railroad from Portland to Bridgton, through Westbrook, Windham, Raymond, Vaso and Naples, for which the petition of the Portland & Northern Railroad Company has been approved by the State Railroad Commissioners; it is to be standard gauge and 40 miles long; the company is capitalized at $160,000, and William M. Sturges and N. D. Sturges, of Scranton, Pa., are principal stockholders.

Duluth, Minn.—The Duluth Street Railway Company proposes to extend its line.

Aberdeen, Miss.—Franchise has been granted to the Columbus, Pensacola & Memphis Railway Company to construct a line.

Reno, Nev.—The Reno Traction Company will improve its system and extend the line to the plant of the Reno Development Company.

Salisbury, N. C.—The Piedmont-Carolina Railway Company has been incorporated with a capital of $100,000 for the purpose of building an electric railway twelve miles in length.—T. H. Vanveford, W. F. Snyder and J. H. Horah, Incorporators.

Barberton, O.—The Cleveland Engineering Company has taken the contract for making plans and specifications for the Barberton, Doyleston & Orrville Railway.

Bucyrus, O.—Council has granted two interurban railway franchises, one to the Toledo & Columbus Company, which was incorporated only a few days ago, and another to the Columbus, Marion & Bucyrus Company which will build an extension of the C. D. & M. to Bucyrus; George H. Whysall, General Manager of the C. M. & B.

Oklahoma City, Okla.—The Oklahoma City Electric Railway Terminal Association has been chartered to build a terminal line twelve miles long for the use of all electric and interurban railroads; capital, $1,000,000.—Guy V. McClure, Warner E. Moore and others, Directors.

Greenville, S. C.—Bids will be received June 10 for the purchase of $35,000 railway bonds to be issued by the county.

Jonesboro, Tenn.—A. L. Shipley is interested in organizing a company to build an electric road from Jonesboro to Johnson City.

Memphis, Tenn.—The City Council of Lenox has granted the N. C. & St. L. railroad permission to double-track the road through the city and construct a steel viaduct over Cooper avenue, similar to the one over Central avenue; in order to protect the lives of travelers, Council has passed an ordinance requiring the railroad company to erect a safety gate at the junction of Central avenue and the railway tracks.

Abilene, Tex.—The Mineral Wells Interurban Company proposes to extend its lines to Abilene.

Ft. Worth, Tex.—The Northern Texas Traction Company has been granted a franchise for two miles of extension.

Galveston, Tex.—The Galveston, Houston Electric Light Company has been incorporated with a capital stock of $6,000,000, by William K. Neal, Charles E. Gurney and others; this electric company is a construction company, forming for the purpose of taking over the plants of the Galveston-Houston Interurban Company which was recently chartered at Austin.—David Daly, Manager.

Wichita Falls, Tex.—Council has granted a franchise to the local and Fort Worth capitalists for an electric street railway; three miles of the line is expected to be in operation within six months.

BRIDGES

Parkdale, Ark.—The citizens of Parkdale have organized the Parkdale Bridge Company for the purpose of building steel bridge across Bayou Bartholomew and will soon let the contract; estimated cost, $5,000.

Quincy, Cal.—The Plumas County Board proposes to issue $100,000 road and bridge bonds.

Colorado Springs, Colo.—Citizens have petitioned the council for better bridges and railroad crossings. The committee circulating the petitions is composed of P. J. Ryan, R. A. Miller and J. K. Manatta.

East St. Louis, Ill.—Arrangements are being made to build a viaduct over Cahoko creek; the plan is for an eighty-foot viaduct from line to line on Broadway, starting the grade farther east.

Elkhart, Ind.—Residents of Cleveland township and Concord township west of the city are moving to petition for a township line bridge to span the St. Joseph river on the township line.

Tola, Kan.—The County Commissioners have received petitions for nearly two dozen bridges over the county, which will be acted upon shortly.

Reno, Nev.—The Washoe County Commissioners have decided to advertise for two contracts to construct steel bridges across the Truckee; one will be located at the Mayberry ranch, four miles above this town, and the other will be at Verdi; the bridges will each have a span of 150 feet, and will be 14 feet wide.

Rosewell, N. M.—The County Commissioners are advertising for bids on a public highway bridge of metal and concrete, two hundred and sixty feet long over the Pecos River at Hagerman, 24 miles southeast of Rosewell; this is the bridge that figured prominently in the last county election.

Grand Forks, N. D.—The Commissioners of Grand Forks County have decided to build three bridges in Rye township.

Greenlane, Pa.—John Hancock, the Philadelphia ice magnate, has decided to build a $10,000 bridge across the Perkiomen at his own expense.

Nashville, Tenn.—Either the whole or a portion of the $800,000 bridge bonds and all of the $160,000 Criminal Court and jail bonds to be used by this county, will be sold June 25.—W. G. M. Campbell, Chairman of Bond Commission.

Bryan, Tex.—The Brazos County Commissioners Court is favorably considering a proposition to build another iron bridge across the Brazos River, between Brazos and Burleson Counties, at Koppes Ferry; the bridge will cost $15,000 and the proposition is that the county furnish $5,000 cash and build the bridge accepting a loan of $10,000 for six years without interest to complete and open the bridge to the public.

Floresville, Tex.—The County Commissioners Court has decided to build three iron bridges in Wilson County; one is to be across the San Antonio River, three miles west of Potts, seven miles from this city; another across the Cibolo Creek at Kosiusko, twelve miles southeast of this city; the third across Dry Hollow, one mile north of Lazernia.

Laramie, Wyo.—The breaking up of the ice in the North Laramie River resulted in the carrying out of two bridges at the Garrett and Gillespie crossings; the County Commissioners will replace the Garrett bridge with a steel structure, to cost about $2,500; a wooden bridge has been ordered for the Gillespie crossing.

MISCELLANEOUS

Pensacola, Fla.—The city will soon ask for bids for the purchasing of following bonds: $250,000 waterworks, $100,000 of sewer and drainage and $100,000 of paving 4 1-2 per cent. 20 to 30-year bonds; these are the balance of the $750,000 of bonds voted in 1905, of which $300,000 were sold last year.

Duluth, Minn.—An ordinance is before Council authorizing an issue of $50,000 bonds for park purposes.

St. Paul, Minn.—Council has decided to issue $50,000 of the $300,000 bonds authorized by the last Legislature.

Asbury Park, N. J.—The citizens have voted $150,000 bonds for improving the beach front.

Cincinnati, O.—Council has authorized bond issues aggregating $625,000 for various municipal improvements; Guilbert avenue will be widened at a cost of $150,000; the engineer will prepare plans for paving with asphalt of Cutter street and resolutions for brick paving on Frank alley and McMicken avenue and asphalt paving and macadam paving on half a dozen other streets were authorized.

Richmond, Tex.—An election will be held July 25 to decide the question of issuing $35,000 bridge and $75,000 Court House bonds.

Bellows Falls, Vt.—The Village has voted to expend $60,000 on a chemical hose wagon, a steam roller and band concerts for the season.

Wise, Va.—The city has voted for $20,000 improvement bonds.

Wheeling, W. Va.—Council has voted $100,000 bonds for public improvements.

BIDS RECEIVED

Oakland, Cal.—F. H. Dahnke has been awarded contract for intercepting sewers in Eighth, Ninth and Tenth avenues at $19 per lineal foot for 36-inch and $6 for 33-inch concrete sewer; $3.90 for 24-inch pipe sewer, $90 for manholes, $3 for rock filling, $16.25 for pile 20-foot long, $17.15 for 22-foot, $18 for 24-foot, $19.90 for 26-foot, $19.75 for 28-foot and $21.50 for 30-foot, total, $13.797.95; Stanley Contracting Company bid $15,869.52, Burrell Construction Company, $14,347.40 and Atlantic, Gulf & Pacific Company, $15,-971.50.

Waterbury, Conn.—Contracts for the new Baldwin street engine house have been awarded. The successful bidders were Thompson Bros., the Fidelity Construction Company, M. J. Daley, Oscar A. Valentine and the New England Engineering Company. The bids were: Mason work—D. E. Cronan, $8,200; George S. Chatfield, $8,373; Thompson Bros., $7,512; John W. Gaffney & Son, $8,400. Carpenter work—J. F. Bittner, $9,280; Fidelity Construction Company, $8,571. Plumbing—P. H. Garrity, $1,675; M. J. Daley, $1,598; Barlow Bros., $1,722. Steam heating—M. J. Daley, $845; Barlow Bros., $998. Painting—Oscar A. Valentine, $400; W. H. Hoffman, $419. Wiring—New England Engineering Company, $138.

Michigan City, Ind.—William F. Frey, of Lafayette, has been awarded contract for trunk sewer in Franklin street, from Fourth to Eighth street, at $7,220; the bid for 36-inch tile was $5.08; for 30-inch tile, $4.31, and 24-inch tile, $3.17 per lineal foot.

Louisville, Ky.—Figg and Gosnell were low bidders at the letting before the Board of Public Works for the location of nine fire hydrants, at $145 and $146 for each hydrant; Henry Kreamer was low bidder for the construction of the alleys, at $1.59 and $1.85 a square yard for brick construction; the awards will be made later.

Boston, Mass.—Bids were opened for two contracts for work on Section 82, high level sewer, the low bidders being as follows: Contract 56, Jas. Driscoll & Son, $43,350; contract 55, Bryne Constructing Company, $40,320.

Malden, Mass.—The Street and Water Commission opened bids for cast-iron pipe, the contract not being as yet awarded. The bids were as follows: Tenney Morse & Co., ton of 2,000 pounds, $35.50 for 4, 6 and 8-inch pipe, $34.25 for 10, 12 and 16-inch pipe; the other bids were on long tons, and were as follows: John Fox & Co., $39, $40 and $41 according to size; R. D. Wood, $39.50, $39.87, $41 and $41.50 per ton; M. J. Drummond, $41, $42, $42.90 and $43.90 per ton; F. A. Houdlette & Co., $39.50 per ton, all sizes.

Menominee, Mich.—The contract recently awarded to the Hackworthy Construction Company, of Appleton, for the construction of a sewer in Dunlap avenue, has been rescinded by Council and awarded to C. H. Morton, of Marionett, at $1,088.

Brooklyn, N. Y.—Following bids were received, May 8, for several street improvements: Laying sidewalks on Ninety-third street—Norton and Gorman, 303 Douglas street, Brooklyn, $14,053; James Purcell, Brooklyn, $11,178; Seaboard Construction Company, 639 Gates avenue, Brooklyn, $12,-964; Wm. Rosenkrantz, Brooklyn, $12,636; James O'Hara, 157 Hull avenue, Brooklyn, $10,760. Repaving with asphalt on Division avenue—Barber Asphalt Paving Company, 114 Liberty street, New York, $10,175; Uvalde Asphalt Paving Company, 1 Broadway, New York, $10,402. Repaving with asphalt on Cumberland street—Barber Asphalt Paving Company, $11,237; Uvalde Asphalt Paving Company, $11,022.

Schenectady, N. Y.—Two new bids for the collection and disposal of ashes and garbage were received by the Board of Contract and Supply, but action was deferred until the next meeting. The bids follow: Beckwith Brothers, first year $75,000, second year $79,-000, third year $89,000, fourth year $93,000, fifth year $98,000; Alpheus G. Davis, first year $76,000, second year $82,000, third year $91,000, fourth year $95,000, fifth year $98,000; Beckwith Brothers' bid was on a reduction plant, such as has been in successful operation at Syracuse for nine years, and also at New Bedford, Mass.; Davis' bid was on the incinerating system now in operation at Westmount, Province of Quebec, Canada, and which has been installed with success in many cities in Europe.

Beckwith Brothers have been awarded contract for grading Twelfth street, at 49 cents a cubic yard for cut and 34 cents for fill; widen street, at 88 cents a cubic yard for cut, 85 cents for fill and $3 for rock excavation; Eleventh street, 48 cents for cut and 35 cents for fill; J. J. Malloy, Edward street, at 48 cents for cut; A. G. Davis, Pearl street, 38 cents for cut and 24 cents for fill; T. R. Crane has contracts for sidewalks in Brandywine avenue at 68 cents and in Robinson street at 59 cents; Kellam & Shaffer have contract for sewer in Eastern avenue; De Nallo & Klingberg in State street, Kelton avenue and Duane avenue, and W. D. Goodale in Turner and Campbell avenues and Eleventh street.

White Plains, N. Y.—Edward Jackman was the only bidder, and was awarded contract to construct 1,250 square yards asphalt block pavement, 3 inches thick, on 4½-inch concrete base 1:3:6, at $2.84 per square yard; 30 cubic yards of rock and loam excavation included; also 3,000 square feet blue stone flag, 2 inches thick, on 3 inches of sand, at 19 cents per square foot.—Jarvis F. Goerke, Village Engineer.

Akron, O.—P. T. McCourt has the contract for improving Cuyahoga street by grading, curbing and paving with Akron paving block, at $25,000.

Cleveland, O.—The Enterprise Paving Company has been awarded the contract for paving South street at Chardon, O., at their bid of $14,518, which includes $4,992 for brick.

Zanesville, O.—J. C. Williams has the contract for the South Seventh street sewer.

Harrisburg, Va.—The Harrisburg Light, Heat and Power Company bid 7½ cents per kilowatt for electricity; this was away above the usual special rates, and the bid was rejected; store-keepers get the current at 7 cents, and it is understood that the Paxtang company is furnishing current at one-half the price bid.

Philadelphia, Pa.—Bids for the construction of thirty-eight branch sewers in different sections of the city have been opened and scheduled by Assistant Director Benson and Chief Webster, of the Bureau of Surveys. Fifty bids were received for the work, which will involve an expenditure of about $100,000. The work of scheduling the bids will require several days, after which time the awards will be announced.

Bids have been received and contracts awarded by a committee of the Board of Education for the removal of ashes and rubbish from the cellars of school houses. The proposals were asked for all the schools, divided into twelve districts, and the contracts were awarded to C. T. Groswith, E. J. Dorney, David Peoples and Joseph R. Leeright. The cost of the work, according to the awards, will be $6,799.

The contract for the construction of a floating landing stage at Race street wharf was awarded by Director Clay to Edward Fay and Son for $335. This stage was suggested by Mayor Reyburn and is for the use of all small craft desiring to land passengers at Race street wharf.

Hartsville, S. C.—The McCoy Engineer Company, of Baltimore, Md., has been awarded contract to construct waterworks, which will include the sinking of an 18-inch artesian well, with a tower and tank of 150,000 gallons capacity, for drinking purposes, and the connecting of the system with the reservoir of the Hartsville Cotton Mill, of 3,500,000 gallons capacity; two large pumps will be installed, and the town will have the large pump at the cotton mill as a reserve.

Abel & Edwards, of Hickory, N. C., have been awarded contract to construct the sewerage system.

Proposals

WATERWORKS

City of Passaic, N. J.

Proposals for furnishing, excavating the trenches for and laying water pipes, etc.

By direction of the City Council of the City of Passaic, proposals are hereby invited for:

First — Distributing, laying, etc., about thirty-seven (37) miles of six (6) inch to twenty (20) inch pipes, hydrants, etc., the pipes, hydrants, gate valves and specials to be supplied by the City of Passaic, and

Second — Furnishing and delivering all pipes, hydrants, gate valves and specials.

Plans and specifications may be seen and forms of proposals and contract may be obtained at the City Clerk's office or at the City Supervisor's office.

Proposals must be sealed and addressed to the Committee on Water Supply, in care of the City Clerk.

Bidders will be required to give bonds to the amount of their bids.

Each proposal must be accompanied by a certified check for $500 and $1,000 respectively, the checks of the unsuccessful bidders to be returned at once and the check of the successful bidder to be returned as soon as he has executed the proper bond and it has been accepted by the city. In case the party receiving the award fails to furnish the required bond and execute contract within ten days therefrom his certified check will be forfeited to the city.

Work to be completed on or before September 1, 1908.

The City Council reserves the right to reject any or all bids, and all bids must be submitted on Friday evening June 28, 1907, at 8 o'clock.

GEORGE K. ROSE,
JOSEPH SPITZ,
HERMAN FRIEND,
Committee on Water Supply.

Dated Passaic, N. J., May 13, 1907.

PAVING AND SEWERS

Johnson City, Tenn.

Notice.—Sealed proposals will be received by the undersigned until 12 o'clock, noon, July 4, 1907, for the paving of parts of Main, Market, Roan, Spring, Tipton and Buffalo streets, with vitrified brick, bitulithic, Hassam or asphalt; also, all necessary curbing, guttering and sidewalks, of concrete or equally as good material; for about 5,800 feet of 8-inch lateral sewers and for about 5,000 feet of trunk sewer, 18 to 24-inch tile or concrete. All according to plans and specifications prepared by the City Engineer. City reserves the right of paying cash or in bonds. Certified check or approved bond, in the sum of 10 per cent. of amount of bid, must accompany all bids. The city reserves the right to reject any and all bids. Bids will be opened by the Board at 7:30 p. m., July 5. Plans and specifications can be had after June 10 from the undersigned.

E. E. ELLSWORTH,
Recorder.

GRAVEL STREETS

Connersville, Ind.

Notice is hereby given that the City of Connersville will receive bids for three squares of gravel street. Specifications with R. J. Greenwood, City Engineer. Certified check for $100.

JACOB S. CLOUDS,
City Clerk.

BOILERS AND PUMP

St. Clair, Mich.

Sealed proposals will be received by the Board of Public Works of the City of St. Clair, Michigan, for the installation of two 200-horsepower boilers for 150 pounds steam pressure and one pump of 1½ million gallons capacity in 24 hours and also necessary condenser.

Bids to be open to all responsible makers of boilers and pumps, regardless of type.

Bids to be filed with the City Clerk of the above city on or before 12 o'clock a. m., June 14, 1907.

The City of St. Clair reserves the right to reject any or all bids.

Address all inquiries to Brush & Allen, consulting engineers, Detroit, Mich.

Dated St. Clair, Mich., May 29, 1907.

J. C. CHAMBERLIN,
City Clerk.

ASPHALT PLANT

Office of Board of Control.

Norfolk, Va., May 28, 1907.

Proposals will be received at this office until 12 o'clock noon, on the 26th day of June, 1907, for furnishing and constructing an asphalt plant for the City of Norfolk, Va. Specifications for the above may be had on application to this office.

The right to reject any or all bids is specially reserved.

H. HODGES,
Chairman, Board of Control.

BRIDGE

New Orleans, La., May 31, 1907.

Pursuant to ordinance No. 4551, N.C.S., sealed proposals will be received at the office of the Comptroller in the City of New Orleans until the hour of 1 p. m., Monday, July 15, 1907, for the erection of a new bridge of the Bascule, or lift type, to span Bayou St. John, on the prolongation of the axis of Esplanade avenue, in accordance with plans and specifications on file in the office of the City Engineer.

Deposit $1,500 with the City Treasurer, and his receipt enclosed with bid.

Bond in an amount equal to the contract price.

The City Engineer will furnish bidders with a blank form of proposal; no proposal will be considered unless submitted on such form. Bidders must have paid their city license in order that their bids may be accepted.

The city reserves the right to reject any and all bids.

CHAS. R. KENNEDY,
Comptroller.

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